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Monterey, California. Naval Postgraduate School

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AN ANALYSIS OF THE MANAGEMENT INFORMATION  
SYSTEM FOR U. S. COAST GUARD AIRCRAFT  
POLLUTION PATROLS

Jerald Howard Heinz

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## Monterey, California



# THESIS

AN ANALYSIS OF  
THE MANAGEMENT INFORMATION SYSTEM FOR  
U. S. COAST GUARD  
AIRCRAFT POLLUTION PATROLS

by

Jerald Howard Heinz

December 1975

Thesis Advisor:

S. H. Parry

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20.  
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An Analysis of  
the Management Information System for  
U. S. Coast Guard Aircraft Pollution Patrols

by

Jerald Howard Heinz  
Lieutenant Commander, United States Coast Guard  
B.S., United States Coast Guard Academy, 1966

Submitted in partial fulfillment of the  
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the  
NAVAL POSTGRADUATE SCHOOL  
December 1975



## ABSTRACT

The purpose of this thesis is to examine the present data collected and to evaluate its usage in respect to pollution detection by Coast Guard aircraft patrols. It was found that, in general, more detailed and specific information is needed about the patrols. A system for collecting this new data and linking it to the present Pollution Incident Reporting System data base is proposed. The proposed system would allow evaluation of patrols at more specific areas and levels instead of the present district, coast and nationwide levels. Policy decisions could then be more specifically oriented to an area and/or the individual air station.



## TABLE OF CONTENTS

|      |   |    |
|------|---|----|
| I.   | INTRODUCTION-----   | 12 |
| II.  | BACKGROUND-----   | 14 |
|      | A. GENERAL-----   | 14 |
|      | B. MISSION OBJECTIVE AND DESCRIPTION-----                                   | 14 |
|      | C. LEGAL BACKGROUND FOR PROGRAM-----  | 17 |
|      | D. FEDERAL MARINE ENVIRONMENTAL<br>ORGANIZATIONS-----                       | 20 |
|      | E. COAST GUARD ORGANIZATION-----  | 23 |
|      | F. COAST GUARD AIR STATION SAN FRANCISCO-----                               | 30 |
| III. | CURRENT POLLUTION REPORTING SYSTEM-----                                     | 33 |
|      | A. AIRCRAFT FLIGHT RECORD-----  | 33 |
|      | B. ABSTRACT OF OPERATIONS AIRCRAFT REPORT---                                | 37 |
|      | C. PORT SAFETY/MARINE ENVIRONMENTAL<br>PROTECTION ACTIVITIES REPORT-----    | 39 |
|      | D. POLLUTION INCIDENT REPORTING SYSTEM-----                                 | 43 |
| IV.  | DATA ANALYSIS-----  | 49 |
| V.   | PROPOSED POLLUTION REPORTING SYSTEM<br>FOR AIRCRAFT-----                    | 63 |
|      | A. PROPOSED FORMS-----  | 66 |
|      | B. AIRCRAFT FLIGHT RECORD NUMBER-PIRS<br>DATA BASE-----                     | 78 |
|      | C. FURTHER BREAKDOWN OF MARINE<br>ENVIRONMENTAL PROTECTION FLIGHT CODE----- | 79 |





|             |   |     |
|-------------|---|-----|
| D.          | PROPOSED PORT SAFETY/MARINE<br>ENVIRONMENTAL PROTECTION ACTIVITY<br>REPORT FOR AIRCRAFT -----                   | 81  |
| E.          | FEEDBACK REPORTS -----  | 83  |
| APPENDIX A: | COAST GUARD MARINE ENVIRONMENT<br>ORGANIZATIONS' MISSIONS AND<br>FUNCTIONS-----                                 | 86  |
| APPENDIX B: | BREAKDOWN OF U. S. COAST GUARD<br>AIRCRAFT OPERATING COST BY TYPE-----  | 94  |
| APPENDIX C: | PLOTS OF TWELFTH COAST GUARD<br>DISTRICT POLLUTION INCIDENTS-----   | 96  |
| APPENDIX D: | EXAMPLES OF SPSS OUTPUTS USING<br>PIRS DATA -----   | 109 |
| APPENDIX E: | CARD FORMAT AND EXAMPLE OF<br>COMPUTER OUTPUT FROM AIRCRAFT<br>FLIGHT RECORD AIR STATION<br>SAN FRANCISCO ----- | 116 |
| APPENDIX F: | TABLES OF POLLUTION INCIDENT<br>CHARACTERISTICS FROM PIRS DATA -----  | 119 |
| APPENDIX G: | COLBOL RECORD FORMATS FOR<br>PROPOSED AIRCRAFT POLLUTION<br>REPORTING SYSTEM-----                               | 128 |
| APPENDIX H: | BREAKDOWN OF THE PIRS RECORD -----  | 134 |
|             | BIBLIOGRAPHY-----   | 141 |
|             | INITIAL DISTRIBUTION LIST -----   | 143 |



## LIST OF TABLES

|       |  |     |
|-------|--|-----|
| I.    | Mission and Flight Hour Breakdown for Air Station<br>San Francisco -----                             | 31  |
| II.   | Flight Description of Aircraft Detecting Pollution At<br>Air Station San Francisco -----             | 49  |
| III.  | Average Mission Hours for Aircraft Flights<br>Detecting Pollution at Air Station San Francisco ----- | 50  |
| IV.   | Detections per Mission for Air Station<br>San Francisco Under Equally Likely Assumptions -----       | 50  |
| V.    | Average Marine Environmental Protection Missions<br>for Air Station San Francisco -----              | 51  |
| VI.   | Information From PSS/MEP Activities Report for<br>Air Station San Francisco -----                    | 52  |
| VII.  | Cost per Detection for Air Station San Francisco-----  | 53  |
| VIII. | PIRS Data on Helo and Fixed Wing Detected Spills<br>from Aircraft at Air Station San Francisco ----- | 54  |
| IX.   | Twelfth Coast Guard District PIRS General<br>Information on All Incidents -----                      | 56  |
| X.    | Breakdown of Cost/Detection at Air Station<br>San Francisco for One Year -----                       | 61  |
| XI.   | Breakdown of Notifier from PIRS Data -----   | 62  |
| XII.  | U. S. Coast Guard Aircraft Operating Costs-----  | 95  |
| XIII. | Aircraft Flight Record Data Card Format -----  | 117 |
| XIV.  | Pollution Incidents Characteristics for All and<br>Coast Guard Detected Nationwide PIRS Data -----   | 120 |
| XV.   | Pollution Incidents Characteristics for Coast Guard<br>Aircraft-Nationwide PIRS Data-----            | 122 |



|        |  |     |
|--------|--|-----|
| XVI.   | Pollution Incidents Characteristics for All and<br>Coast Guard Detected Incidents-Twelfth Coast<br>Guard District PIRS Data-----   | 124 |
| XVII.  | Pollution Incidents Characteristics for Coast Guard<br>Aircraft Detected Incidents-Twelfth Coast Guard<br>District PIRS Data ----- | 126 |
| XVIII. | Proposed Individual Record COBOL Format-----   | 129 |
| XIX.   | Proposed Mission Record COBOL Format -----   | 132 |
| XX.    | Proposed MEP Record COBOL Format -----   | 133 |



## LIST OF FIGURES

|     |   |     |
|-----|---|-----|
| 1.  | Coast Guard Districts and Air Stations-----   | 25  |
| 2.  | Coast Guard Organization for Aircraft Pollution<br>Patrols-----                             | 26  |
| 3.  | Coast Guard Aircraft Flight Record -----  | 35  |
| 4.  | Abstract of Operations Aircraft Report -----  | 38  |
| 5.  | Port Safety/Marine Environmental Protection<br>Activities Report, Page 2 -----              | 40  |
| 6.  | Pollution Incident Reporting System Discharge Form -----                                    | 44  |
| 7.  | Pollution Incident Reporting System Response Form-----                                      | 45  |
| 8.  | Pollution Incident Reporting System Penalty Action<br>Form -----                            | 46  |
| 9.  | Proposed U. S. Coast Guard Flight Record Form -----   | 64  |
| 10. | Proposed U. S. Coast Guard MEP Supplement Form -----  | 65  |
| 11. | Ordinal Scale for Value of Pollution Detection -----  | 72  |
| 12. | Example of Proposed U. S. Coast Guard Flight<br>Record Form -----                           | 75  |
| 13. | Example of Proposed U. S. Coast Guard MEP<br>Supplement Form-----                           | 76  |
| 14. | Proposed Port Safety/Marine Environmental<br>Protection Activities Report for Aircraft----- | 82  |
| 15. | Plot-All Incidents 1973-----  | 97  |
| 16. | Plot-All Incidents 1974-----  | 98  |
| 17. | Plot San Francisco Bay All Incidents 1974-----  | 99  |
| 18. | Plot All Incidents with Some Response Anticipated 1974----                                  | 100 |





|     |   |     |
|-----|---|-----|
| 19. | Plot All Incidents with No Response Anticipated 1974 -----  | 101 |
| 20. | Plot Incidents Detected by Government 1974<br>(Excluding U. S. Coast Guard) -----   | 102 |
| 21. | Plot Incidents Detected by Spiller 1974-----  | 103 |
| 22. | Plot Incidents Detected by Private Sector 1974-----   | 104 |
| 23. | Plot Incidents Detected by Unknown 1974 -----   | 105 |
| 24. | Plot Incidents Detected by All U. S. Coast Guard 1974-----  | 106 |
| 25. | Plot Incidents Detected by Coast Guard Helo 1974 -----  | 107 |
| 26. | Plot Incidents Detected by Coast Guard Fixed Wing 1974 ---  | 108 |
| 27. | SPSS Frequency Output From Nationwide 1973 PIRS<br>Data for Response Data Field -----   | 110 |
| 28. | SPSS Frequency Line Graph Output From Nationwide<br>1973 PIRS Data For Response Data Field-----   | 111 |
| 29. | SPSS Frequency Output From 1973 Nationwide PIRS<br>Data for Quantity Data Field -----   | 112 |
| 30. | SPSS Frequency Line Graph Output From 1973<br>Nationwide PIRS Data for Quantity Data Field-----   | 113 |
| 31. | Partial SPSS Crosstab Output From 1973<br>Nationwide PIRS Data for Notifier by Response -----   | 114 |
| 32. | Partial SPSS Crosstab Output From 1973 Nationwide<br>PIRS Data for Notifier by Quantity-----  | 115 |
| 33. | Computer Output From Air Station San Francisco<br>From Aircraft Flight Record for Quarter Ending<br>31 March 1974 for the HH-52A Helicopter ----- | 118 |
| 34. | PIRS Record Characters 1 thru 80-----   | 135 |
| 35. | PIRS Record Characters 81 thru 160-----   | 136 |
| 36. | PIRS Record Characters 161 thru 240-----  | 137 |



|     |  |     |
|-----|--|-----|
| 37. | PIRS Record Characters 241 thru 320----- | 138 |
| 38. | PIRS Record Characters 321 thru 400----- | 139 |
| 39. | PIRS Record Characters 401 thru 424----- | 140 |



## I. INTRODUCTION

It was the purpose of this thesis to examine the present data collected and evaluate its usage in respect to one element of the U. S. Coast Guard Marine Environmental Protection Program. The element of the program examined was detection of pollution by Coast Guard aircraft. The Twelfth Coast Guard District and Coast Guard Air Station San Francisco were used for the data analysis section of this thesis.

It was found that in general more detailed and specific information was needed from the aircraft pollution detection patrols. The information that was needed was

1. where the aircraft patrolled,
2. how many aircraft employment hours were utilized in specific areas (search effectiveness), and
3. what the cost of those employment hours were (resource hours).

These three items then can be utilized when evaluating the results of the aircraft patrols if linked with the present Coast Guard Pollution Incident Reporting System (PIRS). Evaluation of patrols at the individual air station level instead of whole coast or nationwide aggregation would allow management and policy decisions to be more specifically oriented. Concise policy designed for a specific area would then contribute to a more efficient and effective program.





A proposed aircraft flight record with a supplement form for the Marine Environmental Protection mission was introduced (Chapter V). These new forms are designed to capture more detailed data with little extra effort required of the Coast Guard pilots. The forms are compatible with the present manual system. However, they are formulated to allow easy transfer of the data to computer cards if or when this system becomes automated.

In Chapter II the background and legal basis for the Coast Guard Environmental Protection Program is described along with the organization for the Coast Guard Aircraft Pollution Patrols.

The Coast Guard's present reporting system for aircraft pollution detection patrols is examined in Chapter III. This chapter describes specific data collected on the reports and what information can be obtained from them.

Data from existing reports from Air Station San Francisco for one quarter are analyzed in Chapter IV. Pollution Incident Reporting System data for two years, 1973 and 1974, are also analyzed for characteristics of reported incidents.



## II. BACKGROUND

### A. GENERAL

The United States Coast Guard has primary responsibility for marine environmental protection for the federal government. Coast Guard responsibility has expanded greatly in this mission in recent years with the passage of new federal laws for controlling water pollution. These laws have resulted from the marked increase of the general public's awareness and concern about pollution of the environment and their demands for preservation and improvement of the nation's environment.

With this expanded responsibility, the Coast Guard has increased the resources to be allocated to this mission. This increase of resources has resulted in demands for new data collection at the operating unit level of the Coast Guard. This data is being collected in order to provide information to the Coast Guard managers and "decision makers" as to how effectively and efficiently these resources are being utilized. Then, with the information, budget allocations, new policies and program decisions can be made that will be cost effective.

### B. MISSION OBJECTIVE AND DESCRIPTION

The Coast Guard has defined the objective of its Marine Environmental Protection Program as follows:



"To minimize damage to the marine environment, and to its living resources, caused by the intentional or unintentional acts of man; to increase man's awareness and consideration of the environmental impact of his actions; and to improve the quality of the marine environment."<sup>1</sup>

The objective is further broken down into four elements:

1. Impact assessment
2. Prevention and enforcement
3. Response
4. In-house abatement.<sup>2</sup>

Impact assessment is concerned with definition of the effect and how to determine this effect of all pollutants of United States' navigable waters, tributaries, adjacent shorelines and the high seas. The Coast Guard prepares and reviews Environmental Impact Statements as part of the element. Also, the Coast Guard has a research and development effort for evaluation and selection of various sensors and monitoring equipment for marine pollution.

The purpose of the Prevention and Enforcement Element is to prevent the intentional and unintentional discharges of oil and other hazardous pollutants into United States waters. The mainstay of this element is Coast Guard surveillance. Increases in surveillance tends to decrease intentional discharges because of the fear of potential polluters in being caught and fined. Also, unintentional spills are



reduced because in general the persons become more aware and concerned about possible spillage and are therefore more careful.

The Response Element's purpose is to provide an efficient, coordinated, and effective effort to minimize any damage to the environment as a result of the discharge of oil or any other hazardous pollutant into United States waters. The National Oil and Hazardous Substances Pollution Contingency Plan designated the Coast Guard as the responsible agency for ensuring that proper clean-up action is initiated for all detected discharges. Under this plan, the Coast Guard maintains the National Strike Force, made up of three teams, Atlantic Strike Team, Gulf Strike Team, and Pacific Strike Team.

These teams respond to pollution discharges or threats of potential discharges and provide technical expertise, supervisory assistance, and deployment of special equipment designed for pollution removal operations. Also, in this element is a large Coast Guard research and development effort for pollution containment and removal equipment and hardware.

The last element, In-house Abatement, is concerned with efforts to reduce or eliminate pollution from Coast Guard facilities. Under this element, the Coast Guard is installing sewage treatment equipment on all of its ships.





## C. LEGAL BACKGROUND FOR PROGRAM

The Refuse Act of 1899 prohibits the throwing, discharge or deposit of any refuse matter of any kind into U. S. navigable waters. The "navigable waters of the U.S." generally means the territory from baseline of the coast of the United States to three miles to seaward. This Refuse Act is still in use and enforced by the Coast Guard.

In 1961 the Oil Pollution Act was passed which prohibits the discharge of oil from vessels in the prohibited zone. In general, the prohibited zone is the territory from baseline of the United States coast to 50 miles to seaward. This law covers tankers over 150 gross tons and other vessels over 500 gross tons. A discharge exempted by this act is the pumping of bilges where oil has drained or leaked from the engine and machinery spaces. This exemption makes the law most difficult to enforce except in the larger discharges.

A major piece of legislation is the Federal Water Pollution Control Act of 1970. It provided for the President to promulgate regulations designating hazardous substances and recommended methods for their removal. Executive Order 11548 was issued to implement this Act. It delegated responsibility and authority to the Council on Environmental Quality for preparing, publishing, revising and amending the National Contingency Plan for the removal of oil. The Coast Guard was assigned the general responsibility for preventing oil pollution in the marine environment. The law requires the spiller to give an immediate notice



of his spill to the appropriate agency of the federal government, which is designated by an Executive Order to be the U. S. Coast Guard. Other functions delegated to the Coast Guard from this act are: issuance and regulation of procedures and requirements for equipment, as needed, to prevent discharge of oil from vessels and transportation related to on-shore and off-shore facilities; administration of the pollution fund established to pay for government clean-up of oil or other hazardous substances; issuance and enforcement of regulations for inspections of vessels carrying oil as cargo so as to prevent discharges; enforcement of this act by inspecting and boarding vessels in U. S. navigable waters and the contiguous zone; arresting violators and executing warrants. The contiguous zone is the territory from the United States coast line to 12 miles seaward.

The Federal Water Pollution Act as amended in 1972 and was called the Federal Water Pollution Control Act of 1972. This Act expanded the Coast Guard's geographical responsibilities for pollution control and expanded the 1970 Act to include other hazardous materials in addition to oil. The Act states that the policy of the United States is there shall be no discharges of oil or any hazardous substances in the navigable waters, adjoining shorelines, and the contiguous zone. The administrator of the Environmental Protection Agency (EPA) was charged by the Act to establish and maintain a water quality surveillance program. The purpose of the program is to maintain the quality



of ground waters, navigable waters, contiguous zone, and the high seas. The National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA) and the United States Coast Guard (USCG) are to be utilized by the EPA for this surveillance where practical.

The Federal Water Pollution Control Act (FWPCA) provides for fines and penalties for various violations of the Act. If a hazardous substance is spilled in the designated waters of the Act and is designated as non-removable, the violator is subject to either a penalty between \$500 and \$5,000 based on the substance discharged or a penalty based on the number of units discharged. This penalty shall not exceed \$500,000 for a facility or \$5,000,000 for a vessel.

Failure to report a spill can result in a fine of \$10,000 and one year's imprisonment. A spiller is also subject to a civil penalty of up to \$5,000 for each offense. Failure to comply with regulations concerning inspection, equipment and procedures for prevention of discharges can result in civil penalty up to \$5,000 for each offense. The Coast Guard holds hearings for these civil penalties.

The owner and operator of a vessel, on-shore or off-shore facility are liable for clean-up and removal costs to the federal government for discharges unless the discharge occurred because of one of the following: Act of God; Act of War; negligence of the United States Government; an act of omission of a third party. A vessel owner is liable up to \$100



per gross ton of the vessel or \$14,000,000, whichever is smaller.

The facility owner is liable up to \$8,000,000. If the government can prove willful negligence or misconduct with knowledge of the owner, the owner is liable for the full amount of clean-up and removal costs.

#### D. FEDERAL MARINE ENVIRONMENTAL ORGANIZATIONS

The three organizations which are dominant in Federal Marine Environmental Organizations are the Council of Environmental Quality, the Environmental Protection Agency and the United States Coast Guard. The National Oil and Hazardous Substances Contingency Plan lists their specific responsibilities and they are as follows:

##### 1. Council of Environmental Quality:

This organization sets up the National Oil and Hazardous Substances Contingency Plan and defines responsibilities and terms within the scope of the Plan. Specific definitions of interest are:

a. Minor discharge: less than 1000 gallons on inland waters or less than ten thousand (10,000) gallons in the coastal waters (waters subject to tidal variations).

b. Medium (moderate) discharge: one thousand to ten thousand (1,000 to 10,000) gallons in inland waters and ten to one hundred thousand (10,000 to 100,000) gallons in coastal waters or discharges of harmful quantities as defined in the regulations.

c. Major discharge: more than ten thousand (10,000) gallons inland and one hundred thousand (100,000) gallons in coastal waters OR





a discharge which poses a "substantial threat to the public health or welfare."

d. Removal: clean-up or removal of oil or hazardous substances from water or shoreline or other actions taken to minimize damage.

Responsibilities for enforcement are divided between the agencies involved. The EPA has responsibility for providing the On-Scene-Commander for spills occurring in inland waters, and the Coast Guard is responsible for the coastal waters, Great Lakes, ports and harbors.

The rest of the plan concerns directions and procedures for mobilization of regional and national actions to clean up spills of hazardous substances.

## 2. Environmental Protection Agency

The EPA has the broadest responsibilities with respect to pollution control. In regard to oil pollution the agency:

a. Establishes the requirements and guidelines for preparation of state, local and regional Oil Removal Contingency Plans, and the coordination of those plans with the National Plan.

b. Prohibits the discharge of harmful quantities of oil into the navigable waters of the U. S. that:

1. violate water quality standards

2. present a film, sheen, discoloration or sludge-emulsion.



c. Discharges into the contiguous zone are considered harmful under the same rules except where altered by International treaty or convention.

d. Prohibits the use of dispersants or emulsifiers to circumvent the provisions of the FWPCA.

e. Requires the discharger to notify the U. S. Coast Guard.

f. Requires owners and operators of onshore and offshore facilities to prepare a Spill Prevention Control and Countermeasure Plan (SPCC) that:

1. is effective in satisfying the requirements within the regulations.

2. is certified by a Registered Professional Engineer.

3. meets the approval of the regional administrator of the EPA.

g. Calls for a civil penalty of five thousand dollars (\$5,000) per day for failure to provide a SPCC by a certain date. This date is a function of when the firm begins operations.

h. Sets guidelines for Spill Prevention and Countermeasures Contingency Plans.

### 3. U. S. Coast Guard

The role of the Coast Guard is restricted to regulation of oil pollution incidents that occur on the navigable waters and adjacent shorelines of the United States. Coast Guard regulations:



- a. Establish prohibited zones for discharges within fifty (50) miles of the coast and other designated areas.
- b. Require the keeping of an Oil Record Book.
- c. Delegate authority to the District Commander to assess civil penalties under the Federal Water Pollution Control Act.
- d. Require the notification of the Coast Guard by rapid communications.
- e. Establish equipment and operating standards and inspection requirements for facilities which may discharge hazardous substances into the water.
- f. Authorize the Captain of the Port to suspend operations of dangerous or potentially dangerous firms.
- g. Establish personnel qualifications, requirements for operating manuals, and vessel design standards relating to oil and hazardous substance storage and transfer.
- h. Administer the Pollution Cleanup Revolving Fund.<sup>3</sup>

#### E. COAST GUARD ORGANIZATION

The Coast Guard is organized with its headquarters in Washington, D.C. under the direction of the Commandant. There are two Area Commanders, Atlantic and Pacific, who are in charge of the districts in their respective areas and deal only with specified operational, inspection and training matters. The twelve districts throughout the



Coast Guard generally report directly to the Commandant, but if two or more districts within the same area are involved in a matter then they report first to the Area Commander and then to the Commandant.<sup>4</sup> The Air Stations are under the control of the district in which they are located. The district boundaries and air station locations are shown in Figure 1.

The Coast Guard organizations that are primarily involved in the pollution detection area are as follows: at the Headquarter's level it is the Marine Environmental Protection Division (G-WEP), which is in the office of Marine Environment and Systems (G-W); at the district level, the Marine Environmental Protection Branch (MEP), which is in the Marine Safety Division (m), is the responsible organization. Figure 2 is enclosed to show the organizations' relationships to the air stations. Also enclosed as Appendix A are the specific functions for each of these above organizations, as listed in the Coast Guard Organization Manual (CG-229).

Coast Guard Air Stations allot their flight hours to the various Coast Guard Programs they are able to serve in each of their locations. The major programs are as follows:

1. Search and Rescue Program (SAR)
2. Domestic Icebreaking Program (DI)
3. Marine Environmental Protection Program (MEP)
4. Enforcement of Laws and Treaties Program (ELT)





COAST GUARD DISTRICTS AND AIR STATIONS

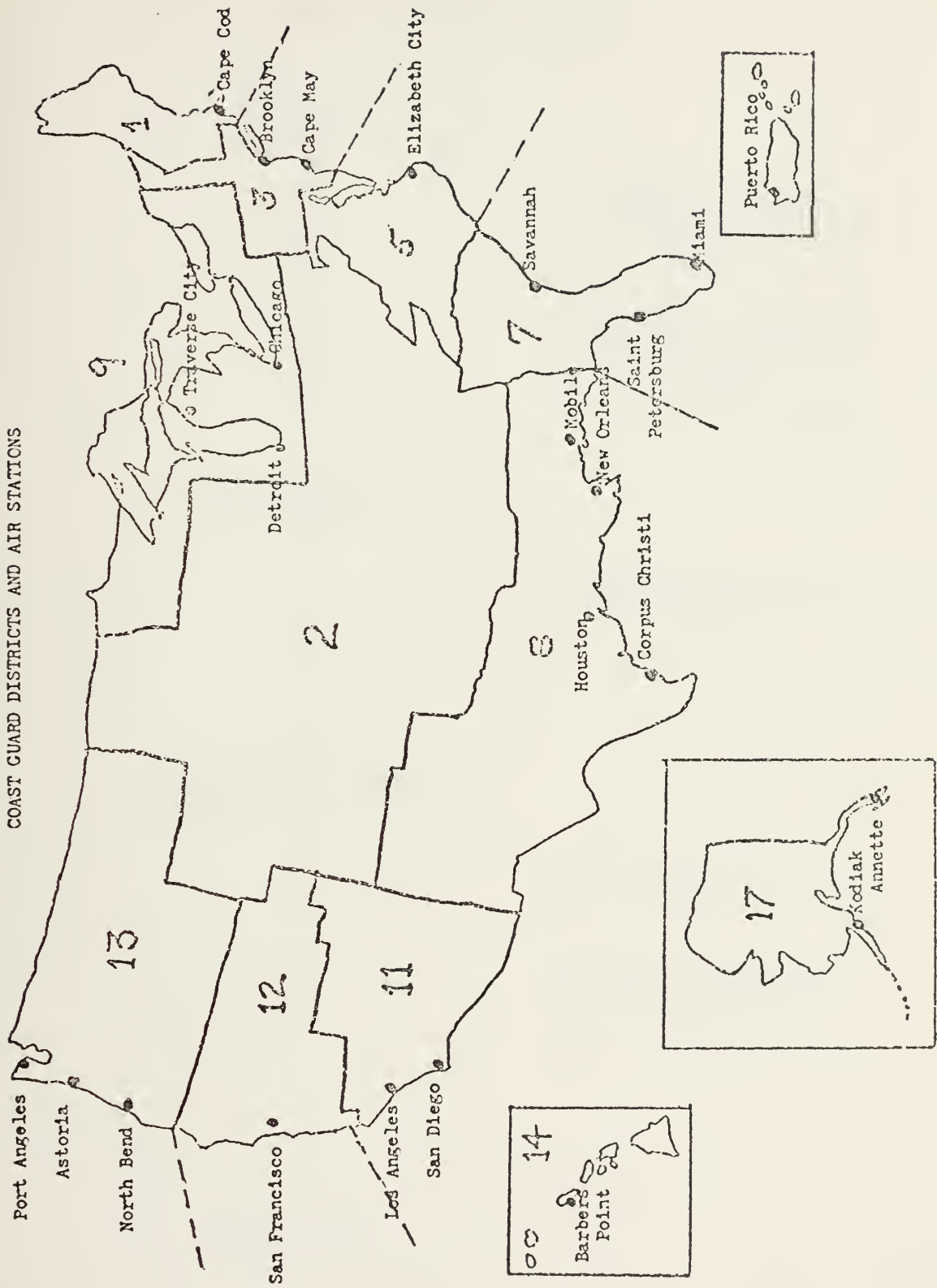


Figure 1



COAST GUARD ORGANIZATION  
FOR  
AIRCRAFT POLLUTION PATROLS

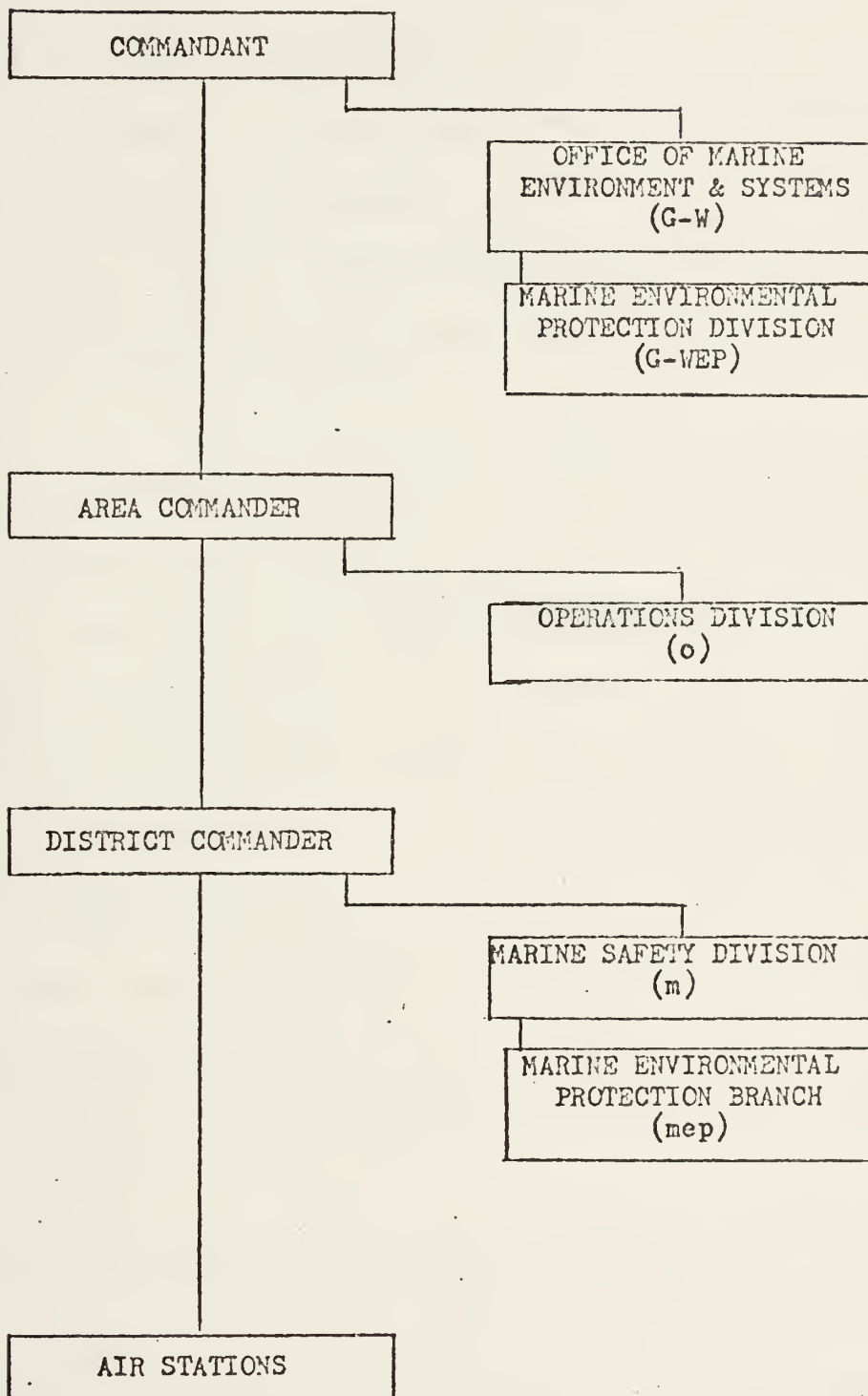


Figure 2



5. Radionavigation Aids Program (RA)
6. Short Range Aids to Navigation Program (AN)
7. Marine Science Activities Program (MSA) and
8. Port Safety and Security Program (PSS)

There are other programs including support programs that Air Station flight hours are used for, but the majority of time is spent on the above programs.<sup>5</sup> Other categories where flight time is allotted but not specifically to a program are operational training, ferry flights, and test flights.

Search and Rescue has been the traditional and primary mission of Coast Guard Aviation. Its objective is to render aid to persons and property in distress on, over and under the high seas and waters under the jurisdiction of the United States. Though primary responsibility is for the maritime region, Coast Guard aircraft are used over adjacent coastal land areas for search and rescue when needed and available. The present trend in Coast Guard Aviation has been an increase in demand for flight time in other programs besides SAR. The Search and Rescue Program still holds a high priority in the demand for the limited aircraft resources, but other programs are starting to make inroads.

The Marine Environmental Protection Program is one of these programs. The major demand for flight hours is for surveillance patrols with some time allocated for response efforts. The Commandant



of the Coast Guard published mission performances standards for the Port Safety and Security Program and the Marine Environmental Protection Programs in Commandant Instruction 2130.11 of 8 January 1973.

The flight surveillance standard for U. S. off-shore waters is to conduct twice weekly flights over territorial waters and the contiguous zone. Also, random flights of the prohibited zone shall be flown.

The standard for port areas handling over 10,000,000 tons of petroleum products per year is to conduct daily surveillance flights of the main harbor and at least 10 miles seaward over the approach channels. The port areas handling over 10,000,000 tons of petroleum products annually presently are:

1. Portland, Maine
2. Boston
3. New York Harbor/New Haven
4. Delaware Bay
5. Chesapeake Bay
6. Mississippi River Delta
7. Lake Charles
8. Port Arthur
9. Galveston Bay
10. Corpus Christi
11. Los Angeles-Long Beach
12. San Francisco Bay
13. Puget Sound<sup>6</sup>.





The response effort utilizes Coast Guard aircraft primarily for transportation of oil pollution containment and removal equipment such as: the high sea oil containment boom; oil skimmers for removal; and the Air-Deliverable and Anti-Pollution Transfer System (ADAPTS), which was developed by the Coast Guard. Coast Guard aircraft are also used as aerial platforms for monitoring and directing clean-up efforts of a pollution discharge.

The Coast Guard presently has four types of aircraft to perform its operational missions:

1. Long Range Search (LRS) - HC-130
2. Medium Range Search (MRS) - HU-16E
3. Medium Range Recovery (MRR) - HH-3F
4. Short Range Recovery (SRR) - HH-52A

The HC-130 is made by Lockheed and is called the "Hercules." It is an all-weather, high performance, four engine, turbo prop, long range aircraft. It is a highly versatile aircraft capable of carrying 35,000 pounds of cargo, or as a search vehicle it can proceed 1200 nautical miles at 25,000 to 30,000 feet altitude at 300 knots, let down and search for 2.5 hours, and return to base.

The HU-16E is made by Grumman and is called the "Albatross." It is an all weather amphibious, twin reciprocating engine, medium range aircraft. Its capabilities as a search aircraft are that it can proceed 500 nautical miles, search for 2.5 hours, and return to base.



The HU-16E is the oldest of the aircraft the Coast Guard has in its inventory. A new aircraft for replacement is in the process of being procured by the Coast Guard at this time.

The HH-3F is built by Sikorsky and is called the "Pelican." It is an amphibious, twin turbine, medium range helicopter. For a rescue, it can proceed 300 nautical miles off-shore hours for 20 minutes or land on the water and return to base. As a search vehicle, it can proceed 200 nautical miles, search for 2.5 hours, and return to base.

The HH-52A is built by Sikorsky and is called the "Sea-Guard." It is an amphibious, single turbine, short range helicopter. This helicopter can proceed 150 nautical miles off-shore at 90 knots, hover for 20 minutes, or land on the water, and return to base. However, an escort is required if proceeding more than 25 nautical miles off-shore because of the single engine configuration and limited navigational capability.<sup>7</sup>

#### F. COAST GUARD AIR STATION SAN FRANCISCO

Coast Guard Air Station San Francisco is in the Twelfth Coast Guard District and located at San Francisco International Airport. This is the only air station in the Twelfth District. Present assignment of aircraft are four HH-52A helicopters, three HU-16E and three HC-130 fixed-wing aircraft. Assignment of personnel at the Air Station are approximately 54 officers and 220 enlisted men. Percentages of number of missions and flight hours flown on various programs for a recent year are shown in Table I.



TABLE I  
MISSION AND FLIGHT HOUR BREAKDOWN FOR  
AIR STATION SAN FRANCISCO  
YEAR ENDING 31 MARCH 1975

H-52A - 4

| MISSION PROGRAM          | NUMBER OF MISSIONS | %    | FLIGHT HOURS | %    |
|--------------------------|--------------------|------|--------------|------|
| SAR                      | 567                | 37.1 | 800          | 39.6 |
| MEP                      | 264                | 17.3 | 369          | 18.2 |
| ELT                      | 15                 | 1.0  | 19           | .9   |
| TRAINING                 | 405                | 26.5 | 650          | 32.1 |
| ALL OTHERS               | 279                | 18.2 | 184          | 9.1  |
| TOTAL MISSIONS - 1530    |                    |      |              |      |
| TOTAL FLIGHT TIME - 2022 |                    |      |              |      |

HU-16E - 3

|                          |     |      |     |      |
|--------------------------|-----|------|-----|------|
| SAR                      | 95  | 18.0 | 366 | 23.1 |
| MEP                      | 93  | 17.6 | 309 | 19.5 |
| ELT                      | 26  | 4.9  | 133 | 8.4  |
| TRAINING                 | 195 | 36.9 | 424 | 26.7 |
| ALL OTHERS               | 119 | 22.5 | 353 | 22.3 |
| TOTAL MISSIONS - 528     |     |      |     |      |
| TOTAL FLIGHT TIME - 1585 |     |      |     |      |

HC-130 - 3

|                          |     |      |      |      |
|--------------------------|-----|------|------|------|
| SAR                      | 233 | 46.7 | 1299 | 61.6 |
| MEP                      | 23  | 4.6  | 70   | 3.3  |
| ELT                      | 41  | 8.2  | 184  | 8.7  |
| TRAINING                 | 159 | 31.9 | 372  | 17.6 |
| ALL OTHERS               | 43  | 8.6  | 183  | 8.7  |
| TOTAL MISSIONS - 499     |     |      |      |      |
| TOTAL FLIGHT TIME - 2108 |     |      |      |      |



Air Station San Francisco mission surveillance requirements for the Marine Environmental Protection Program are covered in Annex G of the Twelfth Coast Guard District Operations Plan. The harbor patrols of San Francisco Harbor are required five times a week and the off-shore patrols are required twice a week.

The harbor patrols of San Francisco Harbor are flown with HH-52A helicopters. The off-shore patrols are divided between the two fixed-wing aircraft models, the HU-16E and the C-130. Response efforts for equipment transport rely mainly on the HC-130's, however both HH-52A and HU-16E could be used for the lighter cargoes or harbor discharges.





### III. CURRENT POLLUTION REPORTING SYSTEM

Presently, there are four main sources that can be used by the program manager or decision maker in managing the Aircraft Pollution Detection Program. They are the Aircraft Flight Records, the Abstract of Operation Aircraft Report, the Port Safety/Marine Environmental Protection Activities Report, and the Pollution Incident Reporting System.

The Aircraft Flight Records are the original source documents that are filled out by pilots in recording the details of their flights. The Abstract of Operation Aircraft Report is in general a summary of mission and flight time by program categories. The Port Safety/Marine Environmental Protection Activities Report is generally concerned with the number of surveillance flights flown, number of detections and total hours flown on the patrols. The last source, the Pollution Incident Reporting System, is a data base with information describing in detail the spill itself, the clean-up efforts, and any penalty action associated with the spill.

#### A. AIRCRAFT FLIGHT RECORD

Before going into greater detail of the above reports, the source document for the Coast Guard aircraft flight hours will be described. This document is part II of the Aircraft Flight Record Coast Guard



Form CG-477 (figure 3). In the Coast Guard Aviation community this document is commonly referred to as the "blue sheet." This sheet is filled out by the aircraft commander for every flight by a Coast Guard aircraft and provides a record of who was on the flight, the total flight time, what mission categories were flown, various detections and arrival time. In general, it is a somewhat detailed breakdown of what was done on the flight.

To better evaluate the multimission flights performed by Coast Guard aviation, the concept of resource hours and employment hours was introduced. The total resource hours on one particular flight are the actual total hours flown. The costs for various programs are "billed" on the resource hours. Employment hours are the hours actually spent on a particular mission on the flight even if two or more missions were being performed at the same time. Therefore, the employment hours for one flight will generally be greater than the resource hours. This concept can be confusing and an example follows for further clarification: A Coast Guard aircraft that flew for a total of four (4.0) hours was assigned two missions to perform, Marine Environmental Protection surveillance (MEP) and Enforcement of Laws and Treaties (ELT). On the flight, these missions were being performed simultaneously for the whole flight. Therefore, the employment hours for the MEP mission would be 4.0 hours and the ELT mission would be 4.0 hours, a total of 8.0 hours. The resource hours should be divided







evenly between the two missions and would be 2.0 hours for MEP and 2.0 hours for ELT, a total of 4.0 hours. Now, consider a similar flight of 4.0 hours, for which the MEP mission was flown first for 1.5 hours and then the ELT mission was flown for 2.5 hours. The employment hours (actual time spent on each mission) would be MEP, 1.5 hours and ELT, 2.5 hours, a total of 4.0 hours. The resource hours would be 1.5 hours MEP and 2.5 hours ELT, also a total of 4.0 hours. Here the resource hours equal the employment hours. This is always true when only one mission is being performed at a time.

The aircraft commander is responsible for using his best judgment to assign the flight hours to various missions performed during his flight. Though a simple concept, it becomes complicated and requires some accurate bookkeeping by the pilot during the flight if simultaneously conducting two or more missions. Consideration has to be given to what missions are being performed when another mission begins or ends. After filling out the front of the "blue sheet," the aircraft commander writes a brief description of the flight on the back and signs his name.

The "blue sheets" are kept at the air station level and information is taken manually from them for completion of the required reports. With this present manual system there is no way to examine the "type" of flight that is detecting pollution incidents. The information that could be of help in managing the detection element of the MEP program is the





other missions being flown with pollution patrols, type of aircraft, whether the aircraft is sensor-equipped, how the pollution was detected, and the number of pollution incidents detected on the patrol.

#### B. ABSTRACT OF OPERATIONS AIRCRAFT REPORT

The Abstract of Operations Aircraft Reports are submitted quarterly by all Coast Guard Air Stations. A copy of the form is included as figure 4. This report is a summary by aircraft type for each air station of total missions, resource hours, and employment hours by program category for the entire quarter. The missions on this report are defined as the number of times a program category is benefited under different sets of orders either written or verbal. This concept is sometimes confused with sortees used in search and rescue. A sortee is defined as a flight from take-off to landing and securing the aircraft.

The Abstract of Operations Aircraft Report reports data to compute a ratio of resource hours to employment hours in the Marine Environmental category. From this ratio a cost per employment hour may be calculated from cost figures per resource hour for each type of aircraft. Even without the cost figure a comparison of ratio between air stations can be examined with the lowest ratio giving the least cost per employment hour.

This ratio can also give an indication for the portion of the employment hours performed on simultaneous multi-mission flights. If the ratio is equal to or very close to one then it can be ascertained that most of the MEP missions performed were one mission at a time. As



|  |          |   |                                |  |  |                                      |                                   |                                |                          |
|--|----------|---|--------------------------------|--|--|--------------------------------------|-----------------------------------|--------------------------------|--------------------------|
| DEPARTMENT OF<br>TRANSPORTATION<br>U. S. COAST GUARD<br>CG-3273A (Rev. 7-73) |          | ABSTRACT OF OPERATIONS AIRCRAFT REPORT                    |                                |  |  | REPORTS CONTROL SYMBOL<br>GOS-2002AV |                                   |                                |                          |
| A. UNIT IDENTIFICATION   |          |   |                                |  |  |                                      |                                   |                                |                          |
| 1. ACCOUNTING CODE NO.   |          | 2. REPORTING UNIT   |                                |  |  |                                      |                                   |                                |                          |
| 3. QUARTER ENDING  |          | 4. NO. BOATS REPORTED                                     |                                | 5. NO. AIRCRAFT MODELS ATTACHED            |  | 6. AIRCRAFT MODEL IDENTIFICATION     |                                   |                                |                          |
| B. UTILIZATION DATA  |          |   |                                |  |  |                                      |                                   |                                |                          |
| EMPLOYMENT<br>CATEGORY   | MISSIONS | NONSHIPBOARD<br>RESOURCE<br>HOURS                         | SHIPBOARD<br>RESOURCE<br>HOURS | EMPLOY-<br>MENT<br>HOURS                   | EMPLOYMENT<br>CATEGORY                     | MISSIONS                             | NONSHIPBOARD<br>RESOURCE<br>HOURS | SHIPBOARD<br>RESOURCE<br>HOURS | EMPLOY-<br>MENT<br>HOURS |
| 7. SEARCH AND<br>RESCUE  |          |   |                                |  | 8. MILITARY<br>OPERATIONS                  |                                      |                                   |                                |                          |
| 9. PORT SAFETY<br>AND<br>SECURITY  |          |   |                                |  | 10. ENFORCEMENT<br>OF LAWS AND<br>TREATIES |                                      |                                   |                                |                          |
| 11. MARINE ENVI-<br>RONMENTAL<br>PROTECTION                                  |          |   |                                |  | 12. SHORT RANGE<br>AIDS TO<br>NAVIGATION   |                                      |                                   |                                |                          |
| 13. RADIO-<br>NAVIGATION<br>AIDS   |          |   |                                |  | 14. OPERATIONAL<br>TRAINING                |                                      |                                   |                                |                          |
| 15. BRIDGE<br>ADMINISTRA-<br>TION  |          |   |                                |  | 16. BOATING<br>SAFETY                      |                                      |                                   |                                |                          |
| 17. DOMESTIC<br>ICEBREAKING  |          |   |                                |  | 18. MILITARY PRE-<br>PAREDNESS             |                                      |                                   |                                |                          |
| 19. POLAR<br>OPERATIONS  |          |   |                                |  | 20. MARINE<br>SCIENCE<br>ACTIVITIES        |                                      |                                   |                                |                          |
| 21. CASUALTY AND<br>OC TRAINING  |          |   |                                |  | 22. RESERVE<br>TRAINING                    |                                      |                                   |                                |                          |
| 23. CO-OP WITH<br>OTHER<br>AGENCIES  |          |   |                                |  | 24. PROFICIENCY<br>TRAINING                |                                      |                                   |                                |                          |
| 25. ADMINISTRA-<br>TIVE  |          |   |                                |  | 26. TEST                                   |                                      |                                   |                                |                          |
| 27. FERRY  |          |   |                                |  |  |                                      |                                   |                                |                          |
| C. DATA SUMMARY  |          |   |                                |  |  |                                      |                                   |                                |                          |
| 28. TOTAL<br>MISSIONS  |          | 29. TOTAL NONSHIPBOARD<br>RESOURCE HOURS                  |                                | 30. TOTAL SHIPBOARD<br>RESOURCE<br>HOURS   |  | 31. TOTAL EMPLOY-<br>MENT HOURS      |                                   |                                |                          |
| 32. SAR<br>STANDBY   |          | 33. ELT STANDBY   |                                | 34. TOTAL<br>PROGRAM<br>STANDBY            |  | 35. TOTAL OTHER<br>STANDBY           |                                   |                                |                          |
| 36. NOT OPERA-<br>TIONAL READY<br>MAINT. (NORM)                              |          | 37. NOT OPERATIONAL<br>READY SUPPLY<br>(NORS)             |                                | 38. TOTAL MAINT.<br>HOURS<br>(NORM + NORS) |  | 39. AVERAGE NO.<br>A/C ASSIGNED      |                                   |                                |                          |
| 40. AIRCRAFT<br>UTILIZATION  |          |   |                                |  |  |                                      |                                   |                                |                          |
| D. REMARKS (Continue on reverse, if necessary)                               |          |   |                                |  |  |                                      |                                   |                                |                          |
|  |          |   |                                |  |  |                                      |                                   |                                |                          |
| DATE   |          | SIGNATURE OF COMMANDING OFFICER<br>OR OFFICER IN CHARGE → |                                |  |  |                                      |                                   |                                |                          |

Previous editions are obsolete

Figure 4



the ratio gets smaller, one can not conclude the exact ratio of sole mission MEP hours to simultaneous multi-mission MEP hours because there is no way to determine how many missions are being performed simultaneously with the MEP mission. However, from this writer's personal experience and research for this thesis, it is assumed that only one mission will be flown simultaneous with the MEP mission, since there are very few instances where an aircraft flight has performed more than two missions at the same time. Therefore, with this assumption, the ratio would range from 1 (no simultaneous multi-mission) to 0.5 (all multi-missions). Therefore, the ratio of 0.75 would mean that one half of the employment hours were simultaneous multi-missions hours where employment hours were shared with another mission.

Also from the Abstract of Operations Report can be obtained the average mission length, which is obtained by taking the total employment hours divided by the total number of missions. This can also be obtained for each aircraft type.

### C. PORT SAFETY/MARINE ENVIRONMENTAL PROTECTION ACTIVITIES REPORT

The purpose of the Port Safety-Marine Environmental Protection Activities Report is to collect data necessary for operational analysis, facilities planning, and budget programming of Coast Guard units performing PSS/MEP duties. A copy of the report is included as figure 5.



# Port Safety/Marine Environmental Protection Activities Report

## Page 2

| SECTION I. MISSION PERFORMANCE STATISTICS (Cont.) |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
|---|---------------------|---------------------------------------|---------------------|--------------------------------|------------------------------|---------------|-------------------------------|------------|------------|-------|--|--|
| ITEM DESCRIPTION                                  |                     | OPERATIONS<br>TOTAL                   | NUMBER<br>COMPLETED | MAN-HOURS<br>EXPENDED          | VEHICLE<br>HOURS<br>EXPENDED | BOAT<br>HOURS | %<br>OF<br>STO                |            |            |       |  |  |
|   |                     | 1                                     | 2                   | 3                              | 4                            | 5             |                               |            |            |       |  |  |
| B. RESPONSE                                       |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 1.a Discharge Monitoring                          |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 1.b Discharge Removal                             |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| C. INVESTIGATION AND ENFORCEMENT                  |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 1.a Main Harbor Surveillance Flights              |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 1.b Coastal and Contiguous Zone Flights           |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 2.a Discharge Investigations                      | POL. Discovered     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
|   | POL. Not Discovered |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 3.a Accident Investigations                       |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| SECTION II. OCCURRENCE REPORT                     |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 1. No. Port Security Cards Issued                 |                     | 3. Violations Detected during Patrols |                     |                                |                              |               |                               |            |            |       |  |  |
|   |                     | ITEM                                  |                     | DISCHARGES                     |                              | LOAD LINE     |                               | ANCHORAGES |            | OTHER |  |  |
|   |                     | DAY                                   |                     |                                |                              |               |                               |            |            |       |  |  |
| 2. No. Security Advisory Warnings Issued          |                     | NIGHT                                 |                     |                                |                              |               |                               |            |            |       |  |  |
|   |                     | REMOTE                                |                     |                                |                              |               |                               |            |            |       |  |  |
| 4. 33 CFR VIOLATIONS                              |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| ITEM  | 124                 | 126                                   | 151                 | 153                            | 154                          | 155           | 156                           |            |            |       |  |  |
| FACILITY  |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| T/V   |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| T/B   |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| M/V   |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| 5. 46 CFR VIOLATIONS                              |                     |                                       |                     |                                |                              |               |                               |            |            |       |  |  |
| ITEM  | D                   | I                                     | N                   | O                              | 6. No. of Casualties         |               |                               |            |            |       |  |  |
| VESSEL  |                     |                                       |                     |                                | a. Facilities                |               |                               |            | b. Vessels |       |  |  |
| 7. No. of Facility                                |                     | 8. No. of Vessels                     |                     | 9. No. of Losses (Thousand \$) |                              |               |                               |            |            |       |  |  |
| a. Deaths   | b. Injuries         | a. Deaths                             | b. Injuries         | a. Facility                    |                              |               |                               | b. Vessels |            |       |  |  |
| 10. No. of SIV.                                   |                     | 11. Oil Transferred (bbls)            |                     | 12. Other Hazardous Substances |                              |               | 13. Volume Oil Spilled (bbls) |            |            |       |  |  |
| a. Port calls                                     | b. Days             |                                       |                     |                                |                              |               |                               |            |            |       |  |  |

Figure 5





The questionnaire is divided into four general areas: Heading, Mission Performance Standards Statistics, Occurrence Report, and Additional Man-Hours. It is submitted quarterly to the Commandant via the chain-of-command, and only two rows are filled out by air stations. They are row 1, a-Main Harbor Surveillance Flights and row 1. b-Coastal and Contiguous Zone Flights. Instructions for filling out these two rows are contained in Commandant Instruction 5010.5 of 14 September 1973. They are:

"Surveillance Flights"-In column 1 enter the number of discharges detected by surveillance flights. Note that column 5 should contain the number of aircraft hours utilized. Since an overflight may involve more than one main harbor, coastal and contiguous zone flights do not involve shore unit jurisdictions and the required information will not generally be available to the reporting units, this section should be completed in the district "m" report only, using its records or the records of the applicable air station. It should include data on all surveillance flights in that district. No attempt should be made to allocate flights or aircraft hours to a particular shore unit. It should be noted that the revised Abstract of Operations will require the air stations to maintain the data needed to complete the form. "8

From the Port Safety/Marine Environmental Protection Activities Report is obtained the percentage of the standard (described in Chapter II) by number of patrols that were performed and the number of



detections in the two categories: main harbor patrol; and coastal and contiguous zone patrol. These percentages are obtained directly from the report. The average length of each patrol by category can be obtained by dividing the aircraft hours in column 5 by the number of patrols completed in column 2. The average number of detections per patrol or patrol hours can be calculated by dividing the total number of detections in column 1 by the total number of patrols completed or the total aircraft hours.

In column 5 is the number of aircraft hours utilized" for these patrols. This entry is ambiguous as to whether it means employment hours or resource hours. While conducting research for this thesis, it was found that resource hours had been used on some reports and employment hours on others, because the Commandant Instruction 5010.5 of 14 September 1973 was written before the concept of employment hours and resource hours was established. There is no official instruction specifying which hours should be put in column 5. For the current system, one has to examine the Abstract of Operations in conjunction with the hours in column 5 and attempt to ascertain whether they are resource hours or employment hours. These aircraft hours are not broken into aircraft type and are aggregated into one figure of total hours. Therefore, by doing the "detective" work mentioned above, by examining what type of aircraft are attached to the air station, and making assumptions as to what percentage by aircraft type fly in each category of patrol, an approximate cost per detection can be obtained.



#### D. POLLUTION INCIDENT REPORTING SYSTEM

Another source of valuable information available to the program manager of the aircraft Pollution Surveillance Program is the Pollution Incident Reporting System (PIRS). This system was first developed by the Coast Guard in 1971 to collect data relative to the nature of oil discharges into waterways.<sup>9</sup> The PIRS data base was greatly expanded after the Federal Water Pollution Act of 1972. This was necessary to meet the growing demands upon the Coast Guard for information on pollution incidents in United States waters. PIRS now collects data on many aspects of the pollution incident, ranging from reporting the discharge to the issuance of penalty action on the spiller. There are three forms covering the three phases of an incident: discharge, response and penalty action. They are included as figures 6, 7 and 8, respectively.

The data is first collected on Coast Guard standard forms by local Coast Guard units that receive the information from internal reporters or from agencies, corporations, and individuals outside the Coast Guard. The forms are then sent to district for validation and data processing. It is keypunched and sent over telephone lines to Coast Guard Headquarters in Washington, D.C. At Headquarters, the data is batch-processed and stored on magnetic tape. The record key is a unique number assigned to the incident at the district level. Record length is 424 characters with approximately 68 data fields.

The Pollution Incident Reporting System contains a vast storehouse of data. Information of importance to the program manager that can be



| DEPARTMENT OF<br>TRANSPORTATION<br>U. S. COAST GUARD<br>CG-4890 (10-74)                                       |                    | POLLUTION INCIDENT REPORTING SYSTEM<br>(PIRS)<br>(DISCHARGE) |             | INPUT TO PIRS PRE-EDIT 12210M |     |     |
|---|--------------------|--|-------------|-------------------------------|-----|-----|
| NOTE: 1. A - Alpha, N - Numeric (zero-fill), A N - Alpha-Numeric<br>2. Columns 1 thru 16 come for both cards. |                    |  |             |                               |     |     |
| FIELD   |                    | CARD COLUMN  | DATA        |                               |     |     |
| RECORD ID   | District           | 1-2 (N)  |             |                               |     |     |
|   | Sequence Number    | 3-7 (N)  |             |                               |     |     |
|   | Date of Incident   | 8 - 13 (N)   | Yr.         | Month                         |     | Day |
|   | Transaction Code   | 14 - 16 (A)  | ADD/COR/DEL |                               |     |     |
| DISCHARGE   | Card Number        | 17 (N)   | 1           |                               |     |     |
|   | Time of Occurrence | 21 - 23 (N)  | Day of Week | Hour of Day                   |     |     |
|   | Location           | 24 - 33 (A/N)  |             |                               |     |     |
|   | State              | 34-35 (A)  |             |                               |     |     |
|   | Water Body         | 36 - 38 (N)  |             |                               |     |     |
|   | Source             | 39 - 41 (A/N)  |             |                               |     |     |
|   | Source Identifier  | 42 - 49 (N)  |             |                               |     |     |
|   | Cause              | 51-52 (A)  |             |                               |     |     |
|   | Operation          | 54-55 (N)  |             |                               |     |     |
|   | Material           | 56 - 59 (N)  |             |                               |     |     |
|   | Quantity           | 60 - 67 (A/N)  |             |                               |     |     |
|   | Affected Resources | 69 - 74 (A/N)  |             |                               |     |     |
|   | Report Period Date | 75 - 80 (N)  | Yr.         | Month                         |     | Day |
|   | Card Number        | 17 (N)   | 2           |                               |     |     |
| Wind Speed/Direction  | 21 - 25 (N)        | Knots  | ° True      |                               |     |     |
| Sea Hgt/Swell Direction   | 26 - 30 (N)        | Feet   | ° True      |                               |     |     |
| Current Speed/Direction   | 31 - 35 (N)        | Knots  | ° True      |                               |     |     |
| Notifier  | 40-41 (A/N)        |  |             |                               |     |     |
| Anticipated Response  | 42 (N)             |  |             |                               |     |     |
| OPFAC Number  | 44 - 53 (A/N)      |  |             |                               |     |     |
| Report Period Date  | 75 - 80 (N)        | Yr.  | Month       |                               | Day |     |

Figure 6





| DEPARTMENT OF<br>TRANSPORTATION<br>U. S. COAST GUARD<br>CG-4890A (10-74)  |                               | POLLUTION INCIDENT REPORTING SYSTEM<br>(PIRS)<br>(RESPONSE) |      | INPUT TO PIRS REPORT 122104 |              |     |
|---|-------------------------------|---|------|-----------------------------|--------------|-----|
| NOTE: 1. A - Alpha, N - Numeric (Zero fill), A N - Alpha-Numeric, and N S - Numeric-Special Character.<br>2. Columns 1 thru 16 same on all cards. |                               |   |      |                             |              |     |
| FIELD   |                               | CARD COLUMN   | DATA |                             |              |     |
| RECORD ID   | District                      | 1-2 (N)   |      |                             |              |     |
|   | Sequence Number               | 3 - 7 (N)   |      |                             |              |     |
|   | Date of Incident              | 8 - 13 (N)  | Yr.  |                             | Month        | Day |
|   | Transaction Code              | 14 - 16 (A)   |      |                             | ADD COR DEL  |     |
| RESPONSE  | Card Number                   | 17 (N)  |      |                             | 3            |     |
|   | Removal Undertaken By (Party) | 21 (N)  |      |                             |              |     |
|   | Equipment:                    | 22 - 24 (N)   |      |                             | 10's of feet |     |
|   | Bloom Materials               | 25-26 (N)   |      |                             | Units        |     |
|   | Recovery Devices              | 27 - 30 (N)   |      |                             | Tons         |     |
|   | Disposable Absorbents         | 31 - 33 (N)   |      |                             | Lbs.         |     |
|   | Recyclable Absorbents         | 34 - 36 (N)   |      |                             | Lbs.         |     |
|   | Burning Agents                | 37 - 39 (N)   |      |                             | Gal.         |     |
|   | Dispersants                   | 40 - 42 (N)   |      |                             | Gal.         |     |
|   | Sinking Agents                | 43-45 (N)   |      |                             | Lbs.         |     |
|   | Personnel (In mon-days):      | 55 - 57 (N)   |      |                             |              |     |
|   | CG Regular                    | 58 - 60 (N)   |      |                             |              |     |
|   | CG Reserve                    | 61 - 63 (N)   |      |                             |              |     |
|   | National Strike Force         | 64 - 66 (N)   |      |                             |              |     |
|   | EPA                           | 67 - 69 (N)   |      |                             |              |     |
|   | Dept. of Defense              | 70 - 72 (N)   |      |                             |              |     |
|   | Commercial                    | 75 - 80 (N)   | Yr.  |                             | Month        | Day |
|   | Report Period Date            |   |      |                             |              |     |
|   | Card Number                   | 17 (N)  |      |                             | 4            |     |
|   | Personnel (Cont.):            | 21 - 23 (N)   |      |                             |              |     |
| Volunteer   | 24 - 26 (N)                   |   |      |                             |              |     |
| Other   | 33 - 35 (N)                   |   |      | Days                        |              |     |
| Duration of Response  | 36 - 43 (A/N)                 |   |      |                             |              |     |
| Amount Recovered  | 44 - 51 (N/S)                 | \$  |      |                             |              |     |
| Cost of Cleanup:  | 52 - 58 (N)                   | \$  |      |                             |              |     |
| Total Cost  | 59 - 65 (N)                   | \$  |      |                             |              |     |
| Expenditures from Pollution Fund  | 66 - 72 (N)                   | \$  |      |                             |              |     |
| Reimbursements to Pollution Fund  | 73 (N)                        |   |      |                             |              |     |
| Reimbursements Pending  | 75 - 80 (N)                   | Yr.   |      | Month                       | Day          |     |
| Reimbursements Reason   |                               |   |      |                             |              |     |
| Report Period Date  |                               |   |      |                             |              |     |

Figure 7



| DEPARTMENT OF<br>TRANSPORTATION<br>U. S. COAST GUARD<br>CG-4890B (10-74)   |  | POLLUTION INCIDENT REPORTING SYSTEM<br>(PIRS)<br>(PENALTY ACTION) |      | INPUT TO PIRS PRE-EDIT 122104 |       |                |       |  |     |  |     |  |  |
|--|--|---|------|-------------------------------|-------|----------------|-------|--|-----|--|-----|--|--|
| NOTE: 1. A - Alpha, N - Numeric (zero-fill)<br>2. Columns 1 thru 16 same on all cards<br>3. The following Card Numbers will be used when: No Action - Card 6, 1st action - Card 6, 2nd action - Card 7,<br>3rd action - Card 8, and 4th action - Card 9. |  |   |      |                               |       |                |       |  |     |  |     |  |  |
| FIELD  |  | CARD COLUMN   | DATA |                               |       |                |       |  |     |  |     |  |  |
| RECORD ID  | District                               | 1-2 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Sequence Number                        | 3 - 7 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Date of Incident                       | 8 - 13 (N)  | Yr.  |                               |       |                | Month |  |     |  | Day |  |  |
|  | Transaction Code                       | 14 - 16 (A)   |      |                               |       | ADD/COR/DEL    |       |  |     |  |     |  |  |
| PENALTY ACTION   | Card Number                            | 17 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | No Coast Guard Action - Reason         | 21-22 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Initiating Agency                      | 26 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Authority                              | 27-28 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Action Taken Against (Party)           | 29 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Action Date                            | 30 - 33 (N)   |      |                               | Month |                |       |  | Day |  |     |  |  |
|  | Referral to U. S. Attorney             | 34 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Referral to COMDT/Other Agency         | 35 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Action by U. S. Attorney               | 36 (N)  |      |                               |       | No - 0/Yes - 1 |       |  |     |  |     |  |  |
|  | Penalty                                |   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Penalty, Fine, or Settlement Assessed  | 39 - 43 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Imprisonment                           | 44-45 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Suspension, Revocation, Probation      | 46 (A)  |      |                               | S/R/P |                |       |  |     |  |     |  |  |
|  | Hearing or Trial                       | 47 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | First Appeal                           | 48 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Second Appeal                          | 49 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
|  | Civil Action Appealed to U. S. Court   | 51 (N)  |      |                               |       | No - 0/Yes - 1 |       |  |     |  |     |  |  |
|  | Penalty, Fine, or Settlement Collected | 53 - 57 (N)   |      |                               |       |                |       |  |     |  |     |  |  |
|  | Case Closed                            | 58 (N)  |      |                               |       |                |       |  |     |  |     |  |  |
| Report Period Date   | 75 - 80 (N)                            | Yr.   |      |                               |       |                | Month |  |     |  | Day |  |  |

Figure 8



obtained are 1) Where are all the spills occurring?, 2) The total number of spills, 3) Classification of number of spills by volume spilled, 4) Spills detected by Coast Guard aircraft, and 5) Crosstabulation of all data fields by the Coast Guard detected incidents.

One problem with the data base is that an incident is listed in the system as being detected by a Coast Guard aircraft, but does not tell from which air station the aircraft was assigned. Thus, the manager cannot evaluate each air station individually. However, in some districts where there is only one air station and little flying of pollution patrols across district boundaries, an assumption may be made that oil spills in the district detected by Coast Guard aircraft are from the one air station in that district. In order to remove this assumption, a manual search of the air station "blue sheets" would have to be undertaken.

An important tool that can be utilized from the PIRS data is a plot of pollution incidents in an area of responsibility of interest. Conditional requirements on a certain data field or combination of data fields in the record could be attached in the plotting of an incident. Some examples are: only Coast Guard detected incidents, spiller-reported incidents, certain volume-limited incidents and vessels-caused spills.

The location of an incident displayed on a plot in conjunction with such information as notifier, source, material and amount, should be a valuable tool to the manager. It can help the manager assess how his surveillance has worked and provide possible alternatives on where



and how to allocate future surveillance resources. Over a period of time, trends should become evident and can be acted on by the manager in his allocation process or policy decisions. For example, if incidents do not increase in an area where Coast Guard surveillance of offloading operations has been reduced from a mandatory level to a random check, then this reduction in man hours has not adversely affected the program objective and could continue. This plot has much versatility that can be used by the manager in making the program more effective, and examples of these plots are enclosed as Appendix C.





#### IV. DATA ANALYSIS

This chapter examines actual reports from Air Station San Francisco for the quarter ending 31 March 1974, and extracts the information that is available from the reports as explained in Chapter III.

First, from the Aircraft Flight Record can be obtained information describing what type of flight and aircraft detected a pollution incident. The "blue sheets" for the quarter were recorded and keypunched on computer cards (an example of the computer program and output are enclosed as Appendix E). Table II relates flight-detected pollution incidents for the quarter described above:

TABLE II

Flight Description of Aircraft Detecting Pollution  
at Air Station San Francisco for Quarter Ending 31 March 1974

|        | Detections | Number of<br>Flights | Total<br>Resource<br>Hours | Total<br>Employment<br>Hours |
|--------|------------|----------------------|----------------------------|------------------------------|
| HH-52A | 10         | 9                    | 15.0                       | 16.2                         |
| HU-16E | 5          | 5                    | 17.5                       | 17.5                         |

All HU-16E employment hours on MEP were flown on single missions, while 83.8% of the HH-52A MEP employment hours were flown on single missions.

Table III shows the average length of time spent on each mission category per flight.



TABLE III

Average Mission Hours for Aircraft Flights Detecting Pollution  
at Air Station San Francisco for Quarter Ending 31 March 1975

|                         | Total<br>Flight<br>Length | SAR  | MEP  | Operational<br>Training | ELT | Other |
|-------------------------|---------------------------|------|------|-------------------------|-----|-------|
| HH-52A Resource Hours   | 1.67                      | 0.04 | 0.76 | 0.48                    |     | 0.39  |
| HH-52A Employment Hours | 1.80                      | 0.08 | 0.82 | 0.51                    |     | 0.39  |
| HU-16E Resource Hours   | 3.50                      |      | 3.50 |                         |     |       |
| HU-16E Employment Hours | 3.50                      |      | 3.50 |                         |     |       |

In calculating the cost per detection from previous tables, it was assumed that all detections should be credited to MEP flight hours. With the individual flight records available, and assuming that the detections could have been found while conducting any mission, the number of detections credited to MEP flight mission hours can be calculated. The portion of each flight spent on MEP flight hours was calculated and the results are in Table IV.

TABLE IV

Detection per Mission for Air Station San Francisco Under Equally  
Likely Assumptions for Quarter Ending 31 March 1974

| Mission              | Number of Detections |
|----------------------|----------------------|
| MEP                  | 6.12                 |
| SAR                  | 0.57                 |
| Operational Training | 1.69                 |
| ELT                  | 0.00                 |
| Other                | 1.62                 |
| Total                | 10.00                |



Under the first assumption, all ten detections were credited to the HH-52A MEP hours and in the second assumption only 6.12 detections were credited to HH-52A MEP hours. These figures give the minimum to maximum range possible for the detections that can be credited to MEP hours. The true number is to be found somewhere in this range.

Next, from the Abstract of Operations Aircraft the average mission length for the Marine Environmental Protection Program and the resource hour to employment hour ratio are obtained by aircraft type and are in Table V.

Table V

Average Marine Environmental Protection Missions  
for Air Station San Francisco for Quarter Ending 31 March 1974

| Aircraft Type | Average Employment Hour per Mission | Resource Hour to Employment Hour Ratio | Percentage of Employment Hours Where One Mission Performed |
|---------------|-------------------------------------|--|--|
| HH-52A        | 1.375 hrs.                          | .919                                   | 84%  |
| HU-16E        | 2.92 hrs.                           | .836                                   | 67%  |
| HC-130B       | 2.30 hrs.                           | .913                                   | 83%  |

Next, information from the Port Safety/Marine Environmental Protection Activities Report for the same quarter is listed in Table VI.

From a comparison of the two reports, additional information can be extracted, assuming all Main Harbor flights are by HH-52A and all Coastal and Contiguous Zone patrols are by fixed wing aircraft, either the HU-16E or the HC-130B. This assumption is necessary because the



Table VI

Information from PSS/MEP Activities Report from  
Air Station San Francisco for Quarter Ending 31 March 1974

|  | Detections | Number of<br>Flights | Flight<br>Hours | % of<br>Standard |
|--|------------|----------------------|-----------------|------------------|
| Main Harbor Flight                     | 15         | 67                   | 89              | 74.4%            |
| Coastal and Contiguous<br>Zone Flights | 3          | 20                   | 59              | 76.9%            |

The average length of patrol is:

|                             |           |
|-----------------------------|-----------|
| Main Harbor                 | 1.33 hrs. |
| Coastal and Contiguous Zone | 2.95 hrs. |

Detections per patrol:

|                             |      |
|-----------------------------|------|
| Main Harbor                 | .224 |
| Coastal and Contiguous Zone | .150 |

Detections per patrol hour:

|                             |       |
|-----------------------------|-------|
| Main Harbor                 | .169  |
| Coastal and Contiguous Zone | 0.051 |

flight hours are not broken down by aircraft type on this report. The HH-52A had a total of 72 MEP missions and 67 missions (93% of total missions) were San Francisco Harbor patrols. Between the HU-16E and the HC-13B there were 35 missions in MEP with 20 missions (57% of total missions) coastal and contiguous zone patrols.

By using aircraft operating costs, based on resource hours by aircraft type, a cost per detection can be obtained. The U. S. Coast Guard aircraft operating costs effective 1 April 1974 are included as Appendix B. The cost per detection for the quarter by aircraft type and location are as follows:





Table VII

Cost Per Detection for Air Station San Francisco  
for Quarter Ending 31 March 1974

|                                 | A/C Type | Detections | Flight<br>Hours | Cost     | Cost/Detection |
|---------------------------------|----------|------------|-----------------|----------|----------------|
| Harbor Patrol<br>(S. F. Harbor) | HH-52A   | 15         | 89              | \$44,000 | \$2,900        |
| Coastal and<br>Contiguous       | HU-16E   | 3          | 59              | \$40,000 | \$13,300       |
| Zone Patrol                     | HC-130B  | --         | 0               | ---      |                |
| Total                           |          | 18         |                 | \$84,000 | \$4,670        |

It should be noted that the number of detections (eighteen) on the Port Safety/Marine Environmental Protection Activity Report do not agree with the number (fifteen) in the Pollution Incident Reporting System. One reason for the higher number of detections on the Port Safety/Marine Environmental Protection Activity Report is that the incident was already reported by another source before the Coast Guard Aircraft detected it. The PIRS report is usually filled out by the Marine Safety Office handling the spill and the detection is credited to the first source reporting it to the Coast Guard. The second reason could be a communication breakdown between the Marine Safety Office and the Air Station as to which one will fill out the PIRS report, and the report just does not get filed. The only PIRS reports that are filled out by the Air Station are their own detections, which are not responded to by the Marine Safety Office. The only Coast Guard involvement was detection by a Coast Guard aircraft. A third possible reason is that some of the detections claimed



on the Quarterly PSS/MEP report were not in the Twelfth District. This is possible because San Francisco Air Station has monthly Marine Science flights to the San Diego, California area.

Information for Tables VIII and IX was obtained from PIRS data by using the commercial computer programs from Statistical Package for Social Sciences (SPSS). The subprogram FREQUENCIES and CROSS-TABS were utilized, and an example of the SPSS computer program output is enclosed in Appendix D. The assumption is made that all Coast Guard aircraft detected pollution incidents in the 12th Coast Guard District were from Air Station San Francisco. This assumption proved to be valid by checking all the "blue sheets" manually for the date and whether helo or fixed wing responded (checked against PIRS data). The only discrepancy was that one detection in San Francisco Harbor was listed as a helicopter detection in the PIRS data base and the "blue sheet" data indicated it as a fixed wing aircraft.

#### Table VIII

Data on Helo and Fixed Wing-detected Spills from Aircraft at  
Air Station San Francisco by Data Field from PIRS  
for Quarter Ending 31 March 1974

1. Number detected -

Helo:11, which is 8% of total detections from all reporting sources.

Fixed Wing:4, which is 3% of total detections from all reporting sources.



2. Day - There was no discernable pattern to detections on working days (Monday thru Friday). One spill was detected on Saturday.
3. Hour - Detections were evenly distributed between the hours of 0800-1600.
4. Water Body - All 11 helo-detected spills were in San Francisco Harbor, one was within the base line to 3 miles offshore, one was 3 miles to 12 miles offshore, and one was 12-50 miles offshore. These spills detected offshore made up 43% of the total incidents detected offshore.
5. Source of Spill -  
Helo: 2 from on-shore facilities and 9 unknown  
Fixed Wing: 2 from vessels and 2 unknown
6. Cause of Spill -  
Helo: 1 tank overflow, 1 equipment failure (hose rupture) and 9 unknown  
Fixed Wing: all 4 unknown
7. Operation -  
Helo: 1 transfer of oil and 10 unknown  
Fixed Wing: 1 other vessel-related activity and 3 unknown
8. Material Spilled -  
Helo: 1 gasoline, 1 light diesel, 2 unidentified light oil, 1 unidentified heavy oil, 1 incinerator residue and 5 unknown  
Fixed Wing: 1 heavy crude, 1 unidentified light oil and 2 unknown



9. Quantity of Spill -  
Helo: one 3 gallons, one 20 gallons, and 9 unknown  
Fixed Wing: one 50 gallons and 3 unknown
10. Time Elapsed Between Occurrence and Detection -  
Helo: 9 immediate and 2 unknown  
Fixed Wing: 1 immediate and 3 unknown
11. Anticipated Response (clean up) - All CG detected spills had no  
clean up response and were dissipated by weather.

#### Table IX

Twelfth Coast Guard District PIRS General Information  
On All Incidents for Quarter Ending 31 March 1974

#### TOTAL INCIDENTS - 140

1. Day - Spill detections were evenly distributed during weekdays with a slight decreasing trend over weekends.
2. Hour - 75% of the spills were detected between the hours of 0900-1600.
3. Water body - 15% inland, 80% harbor area, 5% offshore.
4. Source - 28% vessel, 30% onshore (7% marine facility, 6% land transportation vehicles, 3.5% land transportation facilities, 15% pipeline, and 13% onshore nontransportation facilities), 3.5% natural source (e.g., natural seepage), and 38.5% unknown source.
5. Cause - 18% structure and equipment failure (of these 24% had personnel error as a contributing factor), 28.5% personnel error (unintentional discharge), 6% natural phenomenon, 44% unknown.





6. Operation - 26.5% no operation in progress, 3% nontransportation operation, 19% facility and land related, 20% vessel related, 31.5% unknown.
7. Material - 75% oil or petroleum product, 3% liquid chemical, 1% incinerator residue, 1% natural, 2% other, 18% unknown.
8. Quantity - 34% unknown, total gallons spilled, 57,965. One spill was 42,000 gallons or 72% of total volume.
9. Notifier - 16.5% of spiller himself, 26.5% Coast Guard, 22% other government agencies, 16.5% commercial vehicles and facilities, 16.5% private individuals, 2% anonymous.
10. Time elapsed between occurrence and discovery - 58% immediate, 18% within one hour, 5.5% within 6 hours, .5% within 12 hours, 3% within 48 hours, .5% within one week, and 14.5% unknown.
11. Anticipated response
  - a. By number of spills, 26.5% some clean up, 63.5% no response.
  - b. By total gallonage, 92% some clean up effort was done. If the 42,000 gallon spill is disregarded, approximately 70% of volume had some clean up effect.
12. General - Of all Coast Guard detected spills, 13.5% had some clean up effort.

The PIRS data indicated that very few of the incidents were in the coastal and contiguous zone areas. Out of the 140 total spills, only 7 were detected in these areas and of these 7 the Coast Guard fixed-wing



detected three spills. Even though the return for the Coast Guard offshore patrols compared to harbor patrols was less, the offshore patrols had a higher percentage of total spills reported in its area.

Comparing the information on Coast Guard aircraft-detected incidents to overall incidents, a general check for large differences between the two can be made. One important fact is that all of the Coast Guard detected spills had no clean-up response. In other words, the Coast Guard spent \$84,000 detecting 15 pollution incidents for which no clean-up effort was expended. Detecting the spills has not resulted in any damage reduction. This should be very disturbing to the program manager. However, this view is narrow in that it does not take into account the deterrence effect or spill prevention that is generated by the patrols. The amount of prevention gained by a pollution patrol is subjective and is open to interpretation. Attempting to quantify the deterrence by experimentation is very difficult on any large scale that would be meaningful. In the deterrence area of pollution incidents, there are many variables and their relationships complex. To isolate the true effect of Coast Guard aircraft patrols would be very difficult if not impossible. The problem of when the increase or decrease in pollution patrols would take effect on the population would also have to be addressed.

A tool that may possibly help evaluate some effect of Coast Guard aircraft pollution patrols is the plot described in Chapter III and



enclosed as Appendix C. The plots used were for the calendar year time period and utilized data from PIRS. Plots of pollution incidents showing all the incidents, spiller-detected incidents, Coast Guard helo-detected incidents, and Coast Guard fixed-wing aircraft respectively, are included. Comparing the different plots yields some interesting results. Almost all of the spiller-detected incidents are in the central area of the San Francisco Harbor. Coast Guard helo-detected spills were in the same general area. Thus, it is possible that the Coast Guard harbor patrols are causing people to report their own spills.

Table X examines the cost per detection concept for Air Station San Francisco during a one year time period. A hidden assumption of the cost per detection measure of effectiveness is that all detections are considered to be of equal value.

Appendix F utilizes data from the PIRS master file for the years 1973 and 1974. The files are on magnetic tape and the Statistical Package for Social Sciences (SPSS) computer programs were utilized to extract the information. Characteristics of pollution incidents are shown for two areas, nationwide and the Twelfth Coast Guard District. Within each area the incidents' characteristics were examined on three different levels: all incidents in the area, all Coast Guard detected incidents in the area, and Coast Guard aircraft-detected incidents in the area. The breakdown of information in this form enables one to examine Coast Guard aircraft-detected incidents in the Twelfth District and to compare those characteristics with all of the incidents in the area



and in the nation. This breakdown of data would allow the Coast Guard Air Station to evaluate its detections in comparison to other detections in the area and nationwide.

Table XI lists a breakdown of who detected the incidents for the nationwide and Twelfth Coast Guard District areas. Also, the table lists a detailed breakdown of Coast Guard detected incidents in both areas.





TABLE X

BREAKDOWN OF COST/DETECTION AT  
CG AIR STATION SAN FRANCISCO FOR  
THE YEAR ENDING 31 MARCH 1975

|   | Detections | Flight Hours | Cost for hrs. | Cost/detection |
|---|------------|--------------|---------------|----------------|
| HH-52A  | 7          | 71           | \$35,100      | \$5010         |
| HU-16E  |            | 56           | \$58,000      |                |
| HC-130  | 10         | 25           | \$33,000      | \$7100         |
| Subtotals for quarter<br>ending 31 March 1975 | 17         | xxx          | \$106,000     | \$6240         |
| HH-52A  | 21         | 78           | \$38,500      | \$1830         |
| HU-16E  |            | 49           | \$33,200      |                |
| HC-130  | 2          | 10           | \$13,200      | \$23,000       |
| Subtotals for quarter<br>ending 31 Dec. 1974  | 23         | xxx          | \$84,900      | \$3690         |
| HH-52A  | 11         | 103          | \$50,900      | \$4630         |
| HU-16E  |            | 120          | \$81,400      |                |
| HC-130  | 0          | 3            | \$4000        | Infinite       |
| Subtotals for quarter<br>ending 30 Sept. 1974 | 11         | xxx          | \$136,300     | \$12,390       |
| HH-52A  | 10         | 117          | \$57,800      | \$5780         |
| HU-16E  |            | 24           | \$16,300      |                |
| HC-130  | 1          | 32           | \$42,200      | \$58,500       |
| Subtotals for quarter<br>ending 31 Jun. 1974  | 11         | xxx          | \$116,300     | \$10,570       |
| Year Totals                                   |            |              |               |                |
| Helo  | 49         | 369          | \$182,300     | \$3720         |
| Fixed wing                                    | 13         | xxx          | \$261,300     | \$20,100       |
| All Aircraft                                  | 62         | xxx          | \$443,600     | \$7155         |

## FOOT NOTES

1. Data obtained from CGAS San Francisco's PSS/MEP Quarterly Report and Quarterly Abstract of Operations.
2. Generalizations of Table
  - A. All main harbor flight hours were HH-52A-Helo.
  - B. All coastal and contiguous zone flight hours were fixed wing aircraft HU-16E and HC-130.
  - C. Only output of patrol is detections not deterrence.
3. Costs per flight obtained from aircraft operating cost published by CG office OSR-2, effective 1 April 1974. (Costs/hr, HH-52A-\$494, HU-16E-\$678, and C130-\$1320.



TABLE XI

BREAKDOWN OF NOTIFIER FROM PIRS DATA  
WITHIN THE COAST GUARD

|   | 1973<br>Nation-<br>Wide | 1974<br>Nation-<br>Wide | 1973<br>12th<br>CG District | 1974<br>12th<br>CG District |
|---|-------------------------|-------------------------|-----------------------------|-----------------------------|
| Total Detected                          | 2888(100)               | 3141(100)               | 188                         | 146                         |
| Percent of Total in<br>Area             | 23.1                    | 21.7                    | 28.5                        | 24.3                        |
| CG Fixed-Wing Aircraft                  | 44(1.5)                 | 82(2.6)                 | 3(1.6)                      | 5(3.5)                      |
| CG Helicopter                           | 958(33.2)               | 1004(32.0)              | 52(27.6)                    | 41(28.1)                    |
| CG Ship                                 | 144(5.0)                | 221(7.0)                | 6(3.2)                      | 10(6.8)                     |
| CG Boat                                 | 266(9.2)                | 334(10.6)               | 11(5.9)                     | 14(9.6)                     |
| CG Shore Unit                           | 421(14.6)               | 327(10.4)               | 56(29.8)                    | 32(21.9)                    |
| CG Personnel Engaged<br>in MEP Function | 1004(34.8)              | 1107(35.2)              | 59(31.4)                    | 33(22.6)                    |
| CG Personnel Off-Duty                   | 24(0.8)                 | 52(1.7)                 | - -                         | 11(7.5)                     |
| CG Auxiliary                            | 27(0.9)                 | 14(0.4)                 | 1(0.5)                      | - -                         |
| NOTIFIER WITH AREA                      |                         |                         |                             |                             |
|   | 1973<br>Nation-<br>Wide | 1974<br>Nation-<br>Wide | 1973<br>12th<br>CG District | 1974<br>12th<br>CG District |
| Notifier<br>Spiller                     | 4554(33.6)              | 5406(37.4)              | 79(12.0)                    | 109(18.2)                   |
| All Coast Guard                         | 2887(21.3)              | 3141(21.7)              | 188(28.5)                   | 146(24.3)                   |
| Federal, State, Local,<br>Gov't         | 1383(10.2)              | 1460(10.1)              | 116(17.6)                   | 128(21.3)                   |
| Private Sector                          | 3470(25.6)              | 3830(26.5)              | 237(35.9)                   | 198(33.0)                   |
| Unknown                                 | 1233(9.1)               | 632(4.4)                | 40(6.0)                     | 19(3.2)                     |



## V. PROPOSED POLLUTION REPORTING SYSTEM FOR AIRCRAFT

In the previous chapters, the present pollution reporting system has been examined. This examination has shown that a need exists for more detailed information for the manager of the aircraft pollution detection program to obtain a more effective and efficient program. It is important to evaluate the information at the air station level because it forms the operational base of the system. With information at the unit level, action and solutions can be applied to individual air stations instead of the present nation-wide standards and policy setting.

More detailed information will have to be obtained from the pilots of the aircraft detection patrols. In order to make this recording of information easier for the pilot, standard throughout the Coast Guard and applicable to future automation of the information system, new forms were developed and are shown as figures 9 and 10. Even though the forms are designed for the information to be keypunched on computer cards, the forms could be used in the present manual system. The proposed file descriptions are enclosed as Appendix G. They could be utilized for batch processed, sequential file on magnetic tape. Also, the file description could be used if random access devices were used for the system and an inverted or threaded file design selected.



# U.S. COAST GUARD AIRCRAFT FLIGHT RECORD

| NAME OF CREW  | INIT<br>F<br>R<br>B | SOCIAL SECURITY<br>NUMBER | FLIGHT TIME |      |      |      | TRAINING |      |      |      | LANDINGS |      |      |            | APPROACHES |      |      |  |
|---------------|---------------------|---------------------------|-------------|------|------|------|----------|------|------|------|----------|------|------|------------|------------|------|------|--|
|               |                     |                           | FP          | CP   | SC   | TYPE | SYB      | MAN  | FIN  | MAN  | 1ST      | 2ND  | 3RD  | INSTR TIME | 1ST        | 2ND  | 3RD  |  |
| A/C COMMANDER | B                   | 910                       | 18M         | 2122 | 2425 | 2725 | 2125     | 2125 | 2125 | 2125 | 2125     | 2125 | 2125 | 2125       | 2125       | 2125 | 2125 |  |
| 2ND CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 3RD CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 4TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 5TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 6TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 7TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 8TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |
| 9TH CREW      |                     |                           |             |      |      |      |          |      |      |      |          |      |      |            |            |      |      |  |

| MISSIONS PERFORMED |       |      |      |      |      |      |   |   |   |
|--------------------|-------|------|------|------|------|------|---|---|---|
| FLT                | START | STOP | RES  | EMP  | 1    | 2    | 3 | 4 | 5 |
| COORD              | TIME  | TIME | HRS  | HRS  |      |      |   |   |   |
| 1                  | 10    | 1514 | 1718 | 2021 | 2318 | 1980 |   |   |   |
| 2                  |       |      |      |      |      |      |   |   |   |
| 3                  |       |      |      |      |      |      |   |   |   |
| 4                  |       |      |      |      |      |      |   |   |   |
| 5                  |       |      |      |      |      |      |   |   |   |
| 6                  |       |      |      |      |      |      |   |   |   |
| 7                  |       |      |      |      |      |      |   |   |   |
| 8                  |       |      |      |      |      |      |   |   |   |
| 9                  |       |      |      |      |      |      |   |   |   |

| RECORD NUMBER |   |   |    | A/C NUMBER |    | JULIAN DATE |    | TOTAL FLT |    | DCPT PT |    | AAR PT |    |
|---------------|---|---|----|------------|----|-------------|----|-----------|----|---------|----|--------|----|
| 1             | 2 | 3 | 4  | 5          | 6  | 7           | 8  | 9         | 10 | 11      | 12 | 13     | 14 |
| 7             | 8 | 9 | 12 | 13         | 15 | 16          | 18 | 19        | 21 | 22      | 24 | 26     | 28 |

IF SUPPLEMENT FORM ENCLOSED MARK WITH X.  
 ELT ☐ ☐  
 MEP ☐ ☐  
 SAR ☐ ☐

Figure 9





U.S. COAST GUARD  
AIRCRAFT FLIGHT RECORD  
MEP SUPPLEMENT FORM

| RECORD NUMBER |  |  |  |  |  |   | SENSOR |  |  |    |
|---------------|--|--|--|--|--|---|--------|--|--|----|
| 1             |  |  |  |  |  | 7 | 8      |  |  | 12 |
|               |  |  |  |  |  |   |        |  |  |    |

| AREA<br>CODE | START<br>TIME |    | STOP<br>TIME |    | RES<br>HRS | EMP<br>HRS | DETECTIONS |    |      |    |    |    |  |  |  |  | LAT |       |       |
|--------------|---------------|----|--------------|----|------------|------------|------------|----|------|----|----|----|--|--|--|--|-----|-------|-------|
|              |               |    |              |    |            |            | T          | H  | PIRS |    |    |    |  |  |  |  |     | ID    |       |
| 13           | 17            | 18 | 21           | 22 | 25         | 26         | 28         | 29 | 31   | 32 | 33 | 34 |  |  |  |  | 43  | 78    | 79 80 |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 1   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 2   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 3   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 4   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 5   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 6   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 7   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 8   P |       |
|              |               |    |              |    |            |            |            |    |      |    |    |    |  |  |  |  |     | 9   P |       |

Figure 10



## A. PROPOSED FORMS

The proposed forms provide spaces to record data which are not available from the present "blue sheets." The primary form (figure 9) collects the same information that is being collected on the present "blue sheet" with the addition of individual social security numbers and record number. The proposed form has spaces for recording individual training by syllabus code and maneuvers, and provides spaces for chronological recording of missions performed on the flight. This form would be filled out for every flight. The supplement forms would be filled out only when specific missions were performed.

The enclosed proposed supplement form (figure 10) is for the Marine Environment Protection program, specifically the detection element. It provides information as follows:

1. Type sensors on aircraft.
2. Specific area being patrolled.
3. Resource and employment hours spent in each area.
4. Detections by type, how it was detected (e. g., visual, SLAR), and PIRS sequence number.

The specific data fields on each form are described below.

### Main Aircraft Flight Record

1. Record Number: Seven digit numbers with the first two digits identifying individual air station and last five digits identifying individual records. Each air station will start at 0001 and issue the individual record number sequentially for each flight flown by the air station aircraft.



2. A/C is the type of aircraft by the following one digit code
  - 1 HH-52A
  - 2 HH-3F
  - 3 HU-16E
  - 4 HC-130B
  - 5 HC-130H
  - 6 HC-130E
  - 7 VC11A
  - 8 VC4A
3. A/C Number: Four digit side number of the aircraft.
4. Julian Date: Three digit date.
5. Total Flight Time: Total actual flight time of the aircraft  
(total resource hours).
6. DEPT PT: Three characters for FAA designation for point of  
origination of the flight.
7. ARR PT: Three characters for FAA designation for point of  
termination for the flight.  
  
[Name of Crew: Print the name of crew member. This will  
not be recorded on computer cards but will be utilized for  
manual reading of the form.]
8. INIT: Two characters for first name and last name initial of  
the individual crew member.
9. Social Security Number: Nine digits to record individual crew  
members' social security number.
10. Flight Time:
  - a) FP: first pilot time.
  - b) CP: copilot time.
  - c) SC: special crew time.



11. TRAINING:

- a) SYB: two characters for recording the syllabus the individual was performing. The first character codes are:

|                      |               |
|----------------------|---------------|
| S-SAR aircrew        | F-First pilot |
| R-Recurrent training | C-Copilot     |
| A-Aircraft Commander |               |

The second character is the designated number flight in the above categories.

- b) COM: one character completion code for the syllabus

|            |              |
|------------|--------------|
| C-complete | I-incomplete |
|------------|--------------|

12. MAN 1

two characters each to record specific

13. MAN 2

maneuvers performed.

14. MAN 3

- a) TPE: the first character for the type maneuver using the following code:

|   |                 |
|---|-----------------|
| A | Autorotation    |
| S | Single engine   |
| D | Ditch drill     |
| B | Bailout         |
| F | Fire drill      |
| P | Platform pickup |
| H | Hoists          |

- b) NO: one character to record the number of times the maneuver was performed.

15. NT: three digits to record the night time for each individual.

16. LANDINGS: to record the type and number of landings per-

formed by the individual. There are spaces allowed for three types of landings.





a) TPE: type of landing by following code:

- 1 Touch and go, land.
- 2 Full stop, land.
- 3 Touch and go, ship.
- 4 Tie down, ship.
- 5 Water

b) NO: the number of landings of that type performed.

17. INSTR. TIME: the recording for instrument time performed.

a) ACT: actual

b) SIM: simulated

18. APPROACHES:

1st

2nd three characters to record specific instrument

3rd approach performed.

TYPE: using the following codes for first character:

- F ADF
- G GCA
- I ILS
- L LF
- O OMNI
- R RADAR
- C LOC

using following codes for second character:

- A actual
- S simulated

NO: the number of instrument approaches of that type performed.

19. LAST: one character to mark with x if last individual on list.

79 and 80 are the individual numbers and individual coding (I)

which are preprinted on the form.



## MISSION PERFORMED SECTION OF MAIN FORM

20. FLT CODE: two digit code for mission category (same as presently used aircraft flight record).
21. START TIME: four digits to record time commenced performing mission.
22. STOP TIME: four digits to record time ceased performing mission.
23. RES HRS.: three digits to record resource hours for the mission category.
24. EMP HRS.: three digits to record employment hours for the mission category.
25. LT: one character to mark with x if last mission recorded.  
Columns 79 and 80 are mission number and mission wording (M), which are preprinted on each form.

A row will be filled out for each different mission flown in chronological order. If a mission is flown for two different times during the flight, it will require two entries.

## MEP SUPPLEMENT FORM

The MEP supplement form will be filled out only if a MEP detection mission is flown. A new entry will be made for each area or if more than one detection is made in the same area.



1. RECORD NUMBER: 7 digits, the same number as on the main form.
2. SENSOR: five digits to record what sensors are being used by the aircraft. The number 00001 would mean visual only with the code for other sensors such as side-looking radar to be developed as the equipment becomes operational.
3. AREA CODE: five digit code to record what area is patrolled. The last three digits are the same code as the PIRS water body code. The first two digits would be the code for specific areas to be specified by the MEP program manual (e.g., San Francisco Harbor, Monterey Harbor, etc.). This area designation would be published on a national chart which would be easily read for use in the cockpit.
4. START TIME: 4 digit code to record the beginning of the patrol of an area.
5. STOP TIME: 4 digit code to record the end of the patrol of an area.
6. DETECTIONS: to record information on a pollution detected.
  - a) TY: one digit to record the type of detections. A suggested code would be an ordinal scale measure of the value of the detections. The detections should be broken into four main categories: harbor and inland area, territorial seas, contiguous zone, and prohibited zone. Each of these location categories should be further broken down into ordinal values that are categorized by location, area and volume of incident.

Figure 11 is enclosed to show the table of ordinal values. All



ORDINAL SCALE FOR VALUE  
OF  
POLLUTION DETECTION

| LOCATION AREA                             | VOLUME IN GALLONS |                 |                   |                     |                       |                        |
|---|-------------------|-----------------|-------------------|---------------------|-----------------------|------------------------|
|   | 10<br>and<br>less | 11<br>to<br>100 | 101<br>to<br>1000 | 1001<br>to<br>10000 | 10001<br>to<br>100000 | more<br>than<br>100000 |
| HARBOR and INLAND                         | 1                 | 2               | 3                 | 4                   | 5                     | 5                      |
| TERRITORIAL SEA<br>(0-3 miles offshore)   | 1                 | 1               | 2                 | 3                   | 4                     | 5                      |
| CONTIGUOUS ZONE<br>(3-12 miles offshore)  | 1                 | 1               | 1                 | 2                   | 3                     | 4                      |
| PROHIBITED ZONE<br>(12-50 miles offshore) | 1                 | 1               | 1                 | 1                   | 2                     | 3                      |

NUMBER CLASSIFICATION

5-major  
4-medium  
3-minor  
2-low minor  
1-trivial

THE HIGHER THE NUMBER THE MORE VALUE OF DETECTION

Figure 11





measures of effectiveness using cost per detection assume that the value of all detections are the same. In reality, this assumption is completely false. The volume and location values are based on classification of incidents in Federal Register Volume 40, data analysis from PIRS, and the author's adaptation. This scale only gives equality, greater and/or less than values. It is not possible to tell exactly how much more value a 1000 gallon spill detection in inland waters has than a 100 gallon spill detection. This table provides an estimate of value of detections, given location and volume. There is need for further research in this area to devise a criterial scale for the value of detection, given location and volume. Also, the type of material spilled could be considered as a value variable.

- b) HD: one digit to code to record how the pollution was detected (e. g., visual, SLAR, etc.). Coding for this entry is 1 for visual with others to be developed as equipment becomes operational.
- c) PIRS ID: seven digit PIRS sequence number assigned to the spill. This number would be received from the district MEP office during working hours and RCC otherwise on completion of the flight. This will be done by the aircraft commander or the operations duty officer.



7. LAST: one digit to mark with an x if it is the last entry on the mission.

NOTE: Columns 79 and 80 are MEP number and MEP coding (P) respectively.

An example demonstrating the use of the forms is given below.

First, a brief narration of the flight is given. An H-3 aircraft is scheduled for a four hour training flight for pilot upgrading and SAR aircrew training for two trainees. Arrangements were made for work with a Coast Guard boat half way through the flight. MEP detection time is recorded for the flight when the aircraft is over water and, in the discretion of the aircraft commander, is able to detect pollution (i. e., not being completely absorbed in the assigned training mission). One hour into the flight, the aircraft was diverted on an overturned sailboat SAR case and was recalled after one half hour (before reaching the scene). The aircraft then returned to training. After working with the boat, the aircraft commander flew two practice instrument approaches at home field before terminating the flight.

Consider the two forms enclosed as figures 12 and 13 to see how this flight was recorded. The heading and flight time is self-explanatory. LTJG Smith completed his aircraft commander syllabus flight number four and made seven hoists, six platform pickups and three autorotations. The two SAR aircrewmen trainees logged training with Black completing the syllabus number five. Both trainees performed a bailout drill. The



U.S. COAST GUARD  
AIRCRAFT FLIGHT RECORD

| RECORD NUMBER | A/C NUMBER | JULIAN DATE | TOTAL FLIGHT | DEPT PT | ARR PT |
|---------------|------------|-------------|--------------|---------|--------|
| 1             | 784        | 125         | 15           | 1911    | 2224   |
| 2011-113245   | 21170      | 324         | 1605         | 1115    | 1111   |

[illegible]

| MISSIONS PERFORMED |               |              |            |            |      |      |
|--------------------|---------------|--------------|------------|------------|------|------|
| FLT<br>CODE        | START<br>TIME | STOP<br>TIME | RES<br>HRS | EMP<br>HRS |      |      |
| 8                  | 10            | 13:4         | 17/18      | 23         | 76   | 7989 |
| 114                | 11/10         | 11/10        | 10:7       | 11:0       | 2X   |      |
| 111                | 11/10         | 12:4         | 11/10      | 10:3       | 10:5 | 2X   |
| 017                | 11/10         | 11/10        | 10:5       | 10:5       | 3X   |      |
| 114                | 11/13         | 11/10        | 12:1       | 12:5       | 4X   |      |
| 111                | 12/13         | 11/12        | 14         | 10:5       | 5X   |      |
| 111                | 11            | 11           | 11         | 11         | 6X   |      |
| 111                | 11            | 11           | 11         | 11         | 7X   |      |

IF SUPPLEMENT FORM ENCLOSED MARK WITH X.

|                          |                                     |                                     |
|--------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| ELT                      | REP                                 | SAR                                 |

Figure 12



Example of Proposed U. S. Coast Guard MEP Supplement Form

U.S. COAST GUARD  
AIRCRAFT FLIGHT RECORD  
MEP SUPPLEMENT FORM

| RECORD NUMBER |   |   |   |   |   |   | SENSOR |    |   |
|---------------|---|---|---|---|---|---|--------|----|---|
| 1             | 0 | 1 | 1 | 3 | 2 | 4 | 5      | 7  | 8 |
|               |   |   |   |   |   |   |        | 12 |   |
|               | 0 | 0 | 0 | 0 | 0 | 0 | 0      | 1  |   |

| AREA<br>CODE | START<br>TIME | STOP<br>TIME | RES<br>HRS | EMP<br>HRS | DETECTIONS |        |         |    |    |    |    |    |    |    |    |    | L<br>A |   |   |   |  |  |  |    |    |    |
|--------------|---------------|--------------|------------|------------|------------|--------|---------|----|----|----|----|----|----|----|----|----|--------|---|---|---|--|--|--|----|----|----|
|              |               |              |            |            | T<br>Y     | H<br>D | PIRS ID |    |    |    |    |    |    |    |    |    |        |   |   |   |  |  |  |    |    |    |
| 13           | 17            | 18           | 21         | 22         | 25         | 26     | 28      | 29 | 31 | 32 | 33 | 34 | 40 |    |    |    |        |   |   |   |  |  |  | 78 | 79 | 80 |
| 21           | 12            | 08           | 10         | 24         | 11         | 00     | 00      | 10 | 03 | 10 | 05 | 11 | 01 | 00 | 01 | 12 | 03     | 1 | P |   |  |  |  |    |    |    |
| 21           | 12            | 08           |            |            |            |        |         |    |    |    |    | 12 | 01 | 00 | 00 | 11 | 24     | 2 | P |   |  |  |  |    |    |    |
| 21           | 12            | 08           | 11         | 23         | 11         | 30     | 00      | 10 | 02 | 10 | 04 | 11 | 01 | 00 | 00 | 11 | 25     | 3 | P |   |  |  |  |    |    |    |
| 22           | 12            | 08           | 11         | 30         | 00         | 11     | 32      | 04 | 10 | 02 | 10 | 04 |    |    |    |    |        | X | 4 | P |  |  |  |    |    |    |
|              |               |              |            |            |            |        |         |    |    |    |    |    |    |    |    |    |        |   | 5 | P |  |  |  |    |    |    |
|              |               |              |            |            |            |        |         |    |    |    |    |    |    |    |    |    |        |   | 6 | P |  |  |  |    |    |    |
|              |               |              |            |            |            |        |         |    |    |    |    |    |    |    |    |    |        |   | 7 | P |  |  |  |    |    |    |
|              |               |              |            |            |            |        |         |    |    |    |    |    |    |    |    |    |        |   | 8 | P |  |  |  |    |    |    |
|              |               |              |            |            |            |        |         |    |    |    |    |    |    |    |    |    |        |   | 9 | P |  |  |  |    |    |    |

Figure 13





aircraft commander demonstrated one autorotation and flew two practice instrument approaches, an ILS and an ADF. The landings were one land full stop for the aircraft commander and five for the copilot Smith.

Smith also had six water landings.

Now examine the mission flown part of the main form. Note that the missions are logged in chronological order as flown. MEP time was recorded when the aircraft was over water and was able to detect pollution by discretion of the aircraft commander. When the aircraft was diverted, only the SAR mission was being performed. The employment hours and resource hours currently are calculated by the pilot, but if automated in the future, this computation could be accomplished by the computer. Then the pilot would record only the start and stop time for each mission.

The MEP and SAR supplement form boxes were marked because both missions were performed on the flight. Figure 13 shows the completed MEP supplement form for the flight. Note the record number is the same as on the main form. The only sensor equipment was visual. Two areas numbered 21 and 22 in the Atlantic territorial sea (208) were flown over by the aircraft during the MEP detection mission. The double entry for the same area is because two detections were located in the same designated area during the same time period logged. When recording the second detection, only the area code and information about the detection is filled out. The third entry for the same area is for reentering the area after the SAR case. The fourth entry was because



of entering a new area. The resource and employment hours are calculated the same way as the missions performed. The MEP supplement form is a further breakdown by area and detections of the MEP time recorded in Mission Performed section of the main form. Again, if and when the system becomes automated only start and stop time would be needed for each area and the computer would calculate the resource and employment hours for each area.

#### B. AIRCRAFT FLIGHT RECORD NUMBER PIRS DATA BASE

The Coast Guard-detected incidents in the PIRS data base should have the aircraft flight record number of the detecting source. This record would eliminate the need for present assumptions and "detective work" necessary to link the Coast Guard aircraft-detected incidents to the air station to which the aircraft was attached. Presently there are some pollution patrols conducted by air stations across district boundaries (which will most probably increase with the arrival of the new MRS jet aircraft). This increase will make evaluation of surveillance at district level difficult because some resource inputs will be from outside the district.

The new flight record contains the PIRS sequence number and would allow a link to the PIRS data on incidents detected by an individual air station. The addition of the flight record number to the PIRS data would allow a link into the aircraft flight records from the Pollution Incident Reporting System and enhance analysis of the individual flights that found



detections. Addition of the operating facility number (OPFAC) to the PIRS data base for Coast Guard-detected spills other than aircraft would allow evaluation of detections at unit levels in the non-aviation community. This addition will result in the same benefits as evaluating by individual air stations.

#### C. FURTHER BREAKDOWN OF MARINE ENVIRONMENTAL PROTECTION FLIGHT CODE

Presently, all flights that are performing any mission in the Marine Environmental Protection Program are categorized in one flight code, 11. It would be beneficial to break this into two main categories in the aircraft MEP mission: 1) detection/surveillance and 2) response. This will give an accurate figure as to the aircraft resources spent responding to incidents already detected. These two categories could be broken down further into: 1) hours spent actively performing mission, 2) hours spent in support of the mission, and 3) hours spent in training for the mission. This breakdown would allow the program manager to make a detailed analysis of the two main mission performances by knowing how flight hours are used in each category.

This breakdown would require a change in the Abstract of Operation form but the implementation cost would be minimal. The MEP aircraft program has two distinct missions and thus should be divided into at least two main categories. With the coming of the new MRS aircraft, which has the latest in technology pollution surveillance equipment, the



further breakdown of each of the two main categories would also be practical. This new equipment will require training and support hours which should be distinguished from the actual detection patrols. This fact will also pertain to the response category as new pollution clean-up equipment is developed. An example of usage of these new categories follows. A Cape Code aircraft is assigned a Boston Harbor Pollution Patrol. For weather reasons the aircraft has to fly over land to Boston Harbor, conduct the patrol, and return to Cape Cod. It took one-half hour enroute each way with one hour patrol. The hours should be logged 1.0 hours for MEP surveillance actual and 1.0 MEP surveillance support.

The support categories would be aircraft hours that are flown in support of one of the categories, but no actual performance of that mission is being done on that flight leg. These flights would be such as flights to test new equipment, flights to factories for installation of new equipment, etc. The actual surveillance and response categories would be used when actually flying and able to detect pollution or the flight is in response to an actual pollution incident.

The training subcategories are self-explanatory. However, the actual and training hours in both categories could be flown simultaneously and would be treated as the resource hours and employment hours previously discussed. It is possible to fly an actual surveillance flight and instruct personnel in the operation of the surveillance equipment at the same time. It is not possible to fly in the actual category and the support category at the same time.





In researching one quarter's "blue sheets" at Air Station San Francisco, it was noted that one surveillance flight had mechanical problems and parts and maintenance personnel were flown to the downed aircraft. These flight hours were logged to MEP, but should have been distinguished separately and belong in the support category. All that was known by the MEP manager was that a larger number of C-130 hours were flown for MEP missions than was normal. There was no way of determining how these hours were utilized.

#### D. PROPOSED PORT SAFETY/MARINE ENVIRONMENTAL PROTECTION ACTIVITY REPORT FOR AIRCRAFT

The aircraft surveillance flight portion of this report should be removed and made a separate report to be submitted by each air station. This report would eliminate the present aggregation of air station data at the district level. Aircraft hours utilized should be expanded on this report to have both resource hours and employment hours. The patrols in each category should be broken down by aircraft type. Presently, all aircraft types are aggregated into one for each category. The difference in operating costs for type aircraft is as much as 250%. A proposed form for this report is enclosed as Figure 14. The information for this report can be obtained from the new proposed aircraft flight record examined earlier in this chapter.

When the system becomes automated, the need for the air station to submit this report would cease. The information would be available



Proposed Port Safety/Marine Environmental Protection Activities Report  
for Aircraft

QUARTERLY AIRCRAFT

POLLUTION DETECTION REPORT

FOR QUARTER ENDING \_\_\_\_\_

FROM AIR STATION \_\_\_\_\_

AIRCRAFT TYPE \_\_\_\_\_

| LOCATION AREA                             | NUMBER OF DETECTIONS<br>BY VALUE CATEGORY |   |   |   |   |       | RESOURCE<br>HOURS | EMPLOY-<br>MENT<br>HOURS | NUMBER<br>OF<br>PATROLS |
|---|---|---|---|---|---|-------|-------------------|--------------------------|-------------------------|
|   | 1   | 2 | 3 | 4 | 5 | Total |                   |                          |                         |
| HARBOR and INLAND                         |   |   |   |   |   |       |                   |                          |                         |
| TERRITORIAL SEA<br>(0-3 miles offshore)   |   |   |   |   |   |       |                   |                          |                         |
| CONTIGUOUS ZONE<br>(3-12 miles offshore)  |   |   |   |   |   |       |                   |                          |                         |
| PROHIBITED ZONE<br>(12-50 miles offshore) |   |   |   |   |   |       |                   |                          |                         |
| TOTALS                                    |   |   |   |   |   |       |                   |                          |                         |

Figure 14



from the aircraft flight records that are already in the data base. The Abstract of Operations report would also be eliminated from submission by the air stations when the system is automated for the same reasons.

#### E. FEEDBACK REPORTS

All information and reports flow from the units up through the chain, ultimately to headquarters level. There the information is analyzed, with management decisions being made based on these examinations. Feedback to the district and unit level, however, does not occur. Comments were made to the author that the districts and units know what they did and therefore there is no need to send them back reports. This rationalization is completely invalid. The districts and units should know how they are performing in comparison with other districts and similar type units. An example of such a report was enclosed in Appendix F of the analysis of detections characterizing various reporting sources using the PIRS data. Another example is the plots also examined in Chapter IV and enclosed as Appendix C. These plots indicate to the units and the district the utilization of information they are providing. The plots indicate where all the spills reported in this area are located and where the spills which were reported by their district units or own units are located.

This feedback enables the districts and units to become more involved in the program, thus producing more support and commitment



to the MEP program. This increased support will help to open the communication channels in both directions at the district level between the Marine Safety Office, air stations, and district MEP offices. The MSO and air stations are the major detecting sources for the Coast Guard. Opening the communications should increase the competence of the various Coast Guard patrol platforms at the district level.

The proposed new forms, reports and additions to present reports are to provide more detailed and accessible information for the program manager. Implementation of these proposals will provide better information for management and policy decisions, thus producing more efficient and effective aircraft pollution detection patrols. This proposed management information system will help the program to obtain its primary objective of maintaining or improving the quality of the marine environment.

In the cloaks of reports, forms and analysis, the ultimate objective of the program must not be forgotten.





## FOOTNOTES

1. United States Coast Guard, Aviation Plan Study Report (CG-380-2), (April 1973), p. I-MEP-1.
2. IBID.
3. U. S. Code of Federal Regulations 40-CFR 1510 Part II, "National Oil and Hazardous Substances Pollution Contingency Plan" (February 10, 1975).
4. United States Coast Guard, Organization Manual (CG-229) (Washington, D. C. 1974) p. III-1.
5. Aviation Plan Study Report, OpCit p. II-STA.
6. IBID p. I-MEP-5.
7. IBID p. II-CAP-1&2.
8. United States Coast Guard, "Instructions for CG-4957 Port Safety/ Marine Environmental Protection Activities Report, " COMDTINST 5010.5 (14 September 1973).
9. United States Coast Guard, Pollution Incident Reporting System Coding Instruction Manual CG450, (Washington, D. C.) (Oct. 1973) p. 1.



APPENDIX A

COAST GUARD MARINE ENVIRONMENT ORGANIZATIONS'

MISSIONS AND FUNCTIONS

This appendix lists excerpts from the Coast Guard Organization Manual (CG-229). Missions and functions are listed for Headquarter's organizations, the Office of Marine Environment and Systems, and the Marine Environmental Protection Division. The District organizations' missions and functions listed are for the Marine Safety Division and the Marine Environmental Protection Branch.



OFFICE OF MARINE ENVIRONMENT AND SYSTEMS  
(G-W)

1. Mission. To establish and maintain a coordinated Coast Guard environmental program, responsive to intra-service and external requirements; and a comprehensive ports and waterways system, encompassing all aspects of marine transportation, exclusive of vessel safety.
2. Functions. Under the general direction and supervision of the Commandant, Vice Commandant, and Chief of Staff, the Chief, Office of Marine Environment and Systems shall:
  - a. Serve as the Commandant's internal and external coordinator, liaison and spokesman on all environmental protection matters for which the Service has responsibility, to assure: a well-coordinated and effective Coast Guard effort in the prevention, detection and control of pollution; compliance with the Environmental Policy Act; and that required Coast Guard inputs to Departmental and interagency environmental matters are provided.
  - b. Provide policy guidance for and generally direct and coordinate the following major Service-wide functions:
    - (1) Manage and coordinate the Marine Environmental Protection Program as defined above, including the promulgation of policies, standards and guidelines to govern the operations of the National Strike Forces.
    - (2) Establish and maintain the aids to navigation system, including short and long range aids to navigation, to meet the needs of marine and air commerce, the Armed Forces, and the boating public. Control the utilization of buoy tenders and aids to navigation facilities and structures.
    - (3) Act for the Secretary of Transportation (via delegation of authority) on intra-department and external matters relating to port and water resources utilization and development for which the Department has responsibility.
    - (4) Approve the location and clearance of bridges over navigable waters; and regulate the operation of drawbridges.
    - (5) Establish, operate, and maintain vessel traffic systems for ports, harbors, and other waters subject to congested vessel traffic.



- (6) Investigate incidents, accidents, or acts involving the loss or destruction of, or damage to structures which affect, or may affect, the safety or environmental quality of ports, harbors, or navigable waters of the United States.
- (7) Manage functions relating to safety of port facilities and adjacent waters, and movement of hazardous cargo to and from commercial vessels.
- (8) Enforce Federal laws on navigable waters (not included are laws specifically the responsibility of the Offices of Merchant Marine Safety and Boating Safety, as well as matters involving enforcement of maritime treaties and violations on the high seas).
- c. Direct overall planning, budgeting and program evaluation, and provide for special studies, inter-Office liaison and coordination as required at the Office level.
- d. Establish and maintain contacts with other Headquarters Offices concerning shared-use of facilities and required inputs to programs of Office of Marine Environment and Systems.
- e. Promulgate guidelines, standards and directives governing field program management, and establish a system to enable review of effectiveness of field operations.
- f. Be the Program Director for the following programs: Short Range Aids to Navigation; Loran-C; Loran-A; OMEGA; Port Safety and Security; Law Enforcement; Marine Environmental Protection; and Bridge Administration.





MARINE ENVIRONMENTAL PROTECTION DIVISION  
(G-WEP)

Under the general direction and supervision of the Chief, Office of Marine Environment and Systems the Chief, Marine Environmental Protection Division shall:

a. Serve as the Program Manager for the Marine Environmental Protection Program.

b. Coordinate, plan, develop, implement, administer and monitor a system aimed at marshaling and effectively employing the applicable resources of the Coast Guard in an integrated, intensive endeavor to prevent, detect and control pollution of the marine environment in accordance with statutory requirements, the policies of the Department of Transportation, and directives of higher authority.

c. Keep appropriate Headquarters Offices advised of current information on environmental program priorities and of their responsibilities for contributing to the total program output.

d. As directed, represent the Coast Guard and present its views and position on environmental matters at meetings with officials of the Department, other government agencies and the private sector.

e. Consistent with statutory provisions and Departmental policy, arrange for and coordinate Coast Guard assistance to Federal, state and municipal agencies and private enterprise in dealing with environmental matters of mutual concern.

f. Convene meetings with the Environmental Coordinating Staff (composed of representatives from other HQ Offices) on environmental matters to obtain their views and assistance in determining a unified course of action.

g. Keep the Commandant abreast of progress of the total environmental program and informed of problems requiring his personal attention.

h. Insure Coast Guard compliance with the National Environmental Policy Act of 1969 and other related environmental laws.



i. Develop and administer the Coast Guard program to prevent, control, and abate pollution by oil, and other contaminants on waters under United States jurisdiction; issue related policy, standards and guidelines.

j. Plan, program, and budget for Coast Guard environmental protection activities.

k. Coordinate Coast Guard programs for the discharge of its obligations under interagency agreements on environmental protection.

l. Provide for, maintain, and analyze reports to determine environmental protection requirements and the effectiveness of the Coast Guard program.

m. Establish operational procedures and training requirements for Coast Guard personnel and units engaged in environmental protection activities. Prepare and maintain manuals and other controlling instructions.

n. Maintain liaison with Federal agencies which have environmental responsibilities inter-related with those of the Coast Guard.

o. Develop, coordinate and provide for Coast Guard participation regarding the Hazardous Materials Information Center and the National Pollution Control Response Center.

p. Administer the applicable sections of the Water Quality Improvement Act of 1970, Oil Pollution Act of 1965 and the Refuse Act of 1899.



MARINE SAFETY DIVISION  
(m)

Under the general direction and supervision of the District Commander and the Chief of Staff, the Chief, Marine Safety Division shall:

1. Administer an integrated, multi-program system, encompassing Commercial Vessel Safety, Port Safety and Security, and Maritime Environmental Protection, in accordance with policies issued by cognizant program directors.



DISTRICT MARITIME ENVIRONMENTAL PROTECTION BRANCH  
(mep)

Under the direction and supervision of the Chief, Marine Safety Division, the Chief, Maritime Environmental Protection Branch, shall:

1. Administer and supervise the Maritime Environmental Protection Program, and insure uniform and correct application of the maritime environmental laws and regulations.
2. Process and review funding and resource requirements and planning proposals for district units performing maritime environmental protection functions.
3. Administer and supervise the keeping of records (case files) of all reported spills.
4. Administer and process reported violations of the maritime environmental laws and regulations. Prepare recommendations for disposition of civil and criminal violations to the Chief, Marine Safety Division. Keep records of all fines imposed and collected.
5. Process and prepare responses to all appeals to the district commander from decisions of the Chief, Marine Safety Division. If further appeal is made to the Commandant, prepare suitable recommendations and provide all information necessary for a final decision.
6. Prepare daily reports of minor spills and POLREPS of moderate and major spills for transmission to the Commandant (G-WEP) in accordance with contingency plans and current instructions.
7. Closely monitor the effect and effectiveness of the National, Regional, and Sub-regional Contingency Plans. Maintain close liaison with signatories of the National Plan to recommend effective changes as the need arises.
8. Maintain a continuing and updated technical library of pertinent pollution and control technical documents.
9. As directed by the district commander, assume the duties as on-scene coordinator when a major spill or declared pollution incident occurs.





10. Administer, supervise, and correlate with other divisions the preparation of all Environmental Impact Statements. Prepare endorsements on Impact Statements received from other agencies for comment.

11. Coordinate the environmental protection activities of the various district units.

12. Monitor the unit training of personnel performing environmental protection activities.

13. Maintain a continuing and effective liaison with federal agencies (especially Environmental Protection Agency), state agencies, and maritime organizations and industries involved in maritime environmental protection.

14. Review data and information from field units that contribute to management information systems at district and Headquarters levels.



## APPENDIX B

### BREAKDOWN OF U. S. COAST GUARD AIRCRAFT OPERATING COST BY TYPE

This appendix lists all the types of aircraft in the Coast Guard inventory. For each type aircraft, the total costs for fuel and maintenance and personnel are listed. For this, an average cost per hour for each type aircraft was calculated and also listed. This table is released by Coast Guard Headquarters from the Aviation Branch of the Search and Rescue Division.



TABLE XII

U. S. COAST GUARD AIRCRAFT OPERATING COSTS  
Effective 1 April 1974

| ITEM                               | AIRCRAFT |         |       |       |       |             |
|------------------------------------|----------|---------|-------|-------|-------|-------------|
|                                    | C130B/E  | C130H   | HH3F  | HH52A | HU16E | VC11A VC4A  |
| A/C Fuel and Maintenance           |          |         |       |       |       |             |
| SH30                               | 168.6    | 205.4   | 44.0  | 13.9  | 25.7  | 179.5 74.8  |
| SH41 \$K                           | 346.0    | 346.0   | 262.0 | 134.0 | 217.0 | 167.0 114.0 |
| SH42                               | 91.0     | 91.0    | 26.0  | 16.0  | 17.0  | 22.0 20.0   |
| F&M Total Cost (\$K)               | 605.6    | 642.4   | 332.0 | 163.9 | 259.7 | 368.5 208.8 |
| Personnel                          |          |         |       |       |       |             |
| Pilots                             |          |         |       |       |       |             |
| Number                             | 4        | 4       | 3     | 2     | 3     | 3 3         |
| Cost (\$K)                         | 95.4     | 95.4    | 71.6  | 47.7  | 71.5  | 71.5 71.5   |
| Aviation Ratings                   |          |         |       |       |       |             |
| Number (Flight Pay)                | 21       | 21      | 12    | 7     | 10    | 10 10       |
| Cost (\$K)                         | 236.3    | 236.3   | 135.0 | 78.8  | 112.5 | 112.5 112.5 |
| Number (N. F. P.)                  | 3        | 3       | 2     | 1     | 1     | 0 0         |
| Cost (\$K)                         | 30.6     | 30.6    | 20.4  | 10.2  | 10.2  | 0.0 0.0     |
| Gen. Service Ratings               |          |         |       |       |       |             |
| Number                             | 5        | 5       | 3     | 2     | 2     | 2 2         |
| Cost (\$K)                         | 51.0     | 51.0    | 30.6  | 20.4  | 20.4  | 20.4 20.4   |
| Personnel Total Cost (\$K)         | 413.3    | 413.3   | 257.6 | 157.1 | 214.6 | 204.4 204.4 |
| Total Annual Cost (\$K)            | 1,018.9  | 1,055.7 | 589.6 | 321.0 | 474.3 | 572.9 413.2 |
| Planned Annual Utilization (Hours) | 800      | 800     | 700   | 650   | 700   | 800 800     |
| F&M Cost per Hour (\$)             | 757      | 803     | 474   | 252   | 371   | 461 261     |
| Personnel Cost per Hour (\$)       | 517      | 517     | 368   | 242   | 307   | 256 256     |
| Total Cost per Hour (\$)           | 1,274    | 1,320   | 842   | 494   | 678   | 717 517     |



## APPENDIX C

### PLOTS OF TWELFTH C. G. DISTRICT POLLUTION INCIDENTS

This appendix includes examples of plots of pollution incidents for the Twelfth Coast Guard District. These plots were made on the CALCOMP Model 765. The Plotting Package of NPS IBM [Reference 6] was the software used to draw the plot. All points were stored in an array in the program which controlled the pen to draw the outlines. These plots can be very adaptive to location and type of incidents to be plotted.





COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1973 - ALL

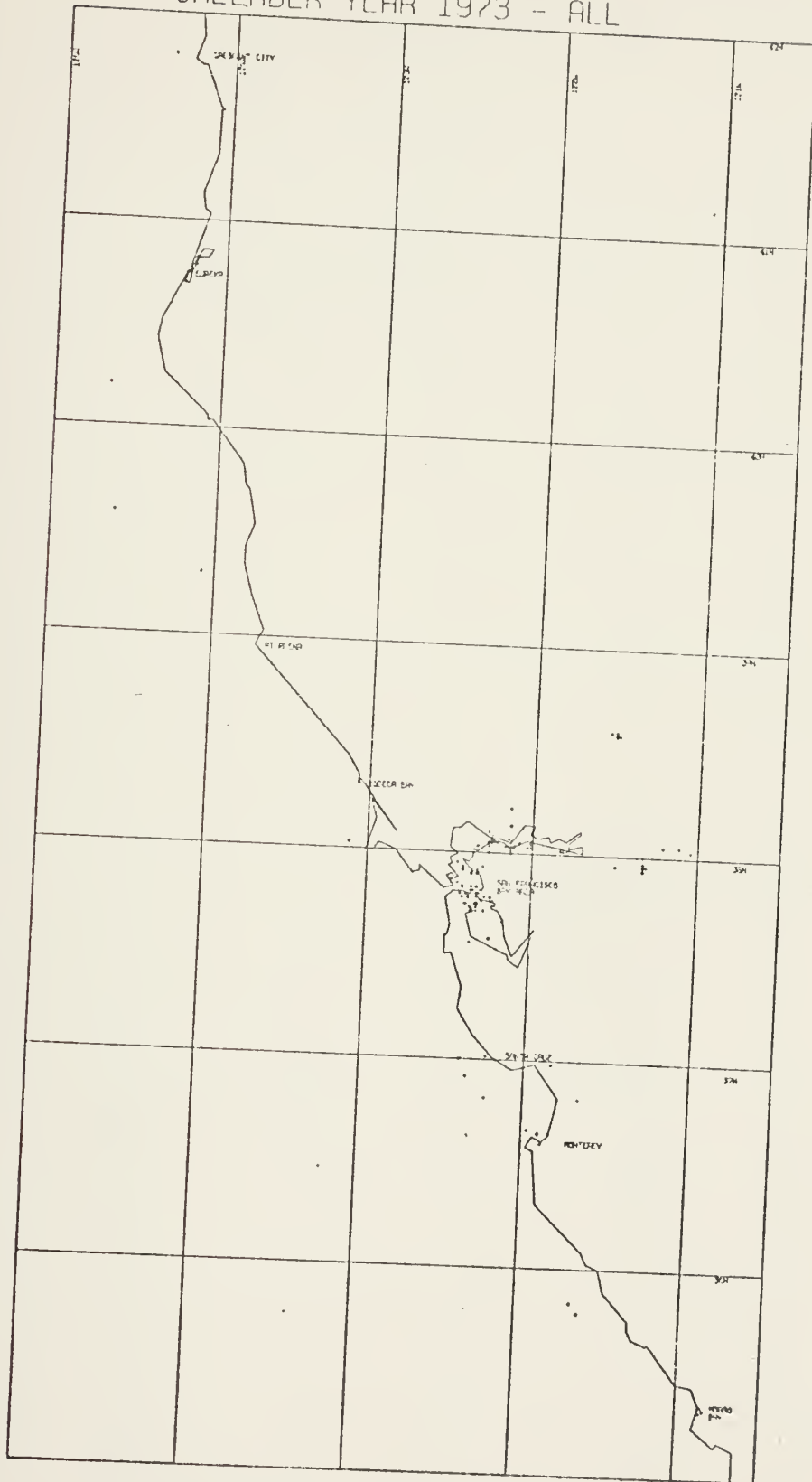


Figure 15



98



SAN FRANCISCO BAY AREA  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974-ALL

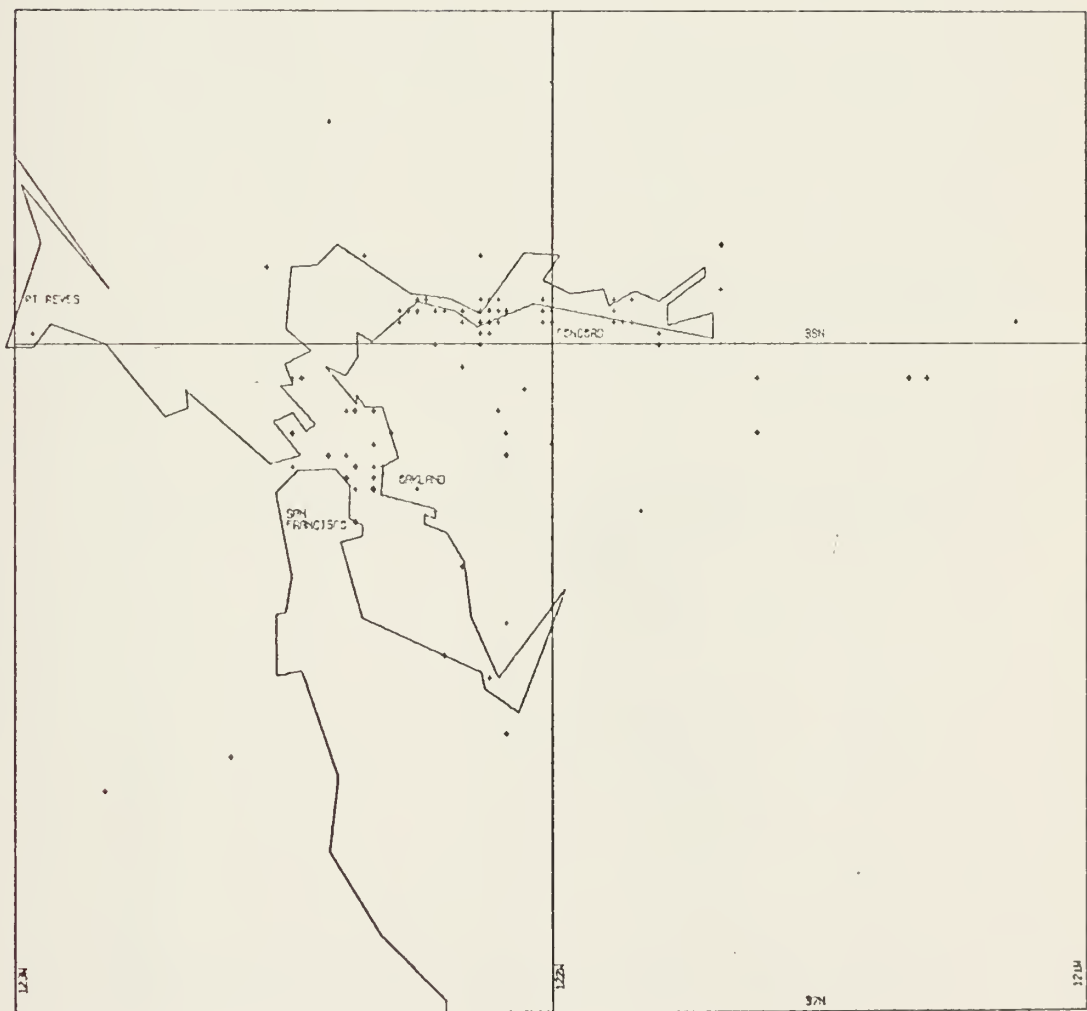


Figure 17



SOME RESPONSE ANTICIPATED  
 COAST GUARD DISTRICT  
 TWELVE  
 POLLUTION INCIDENTS  
 CALENDAR YEAR 1974 - ALL

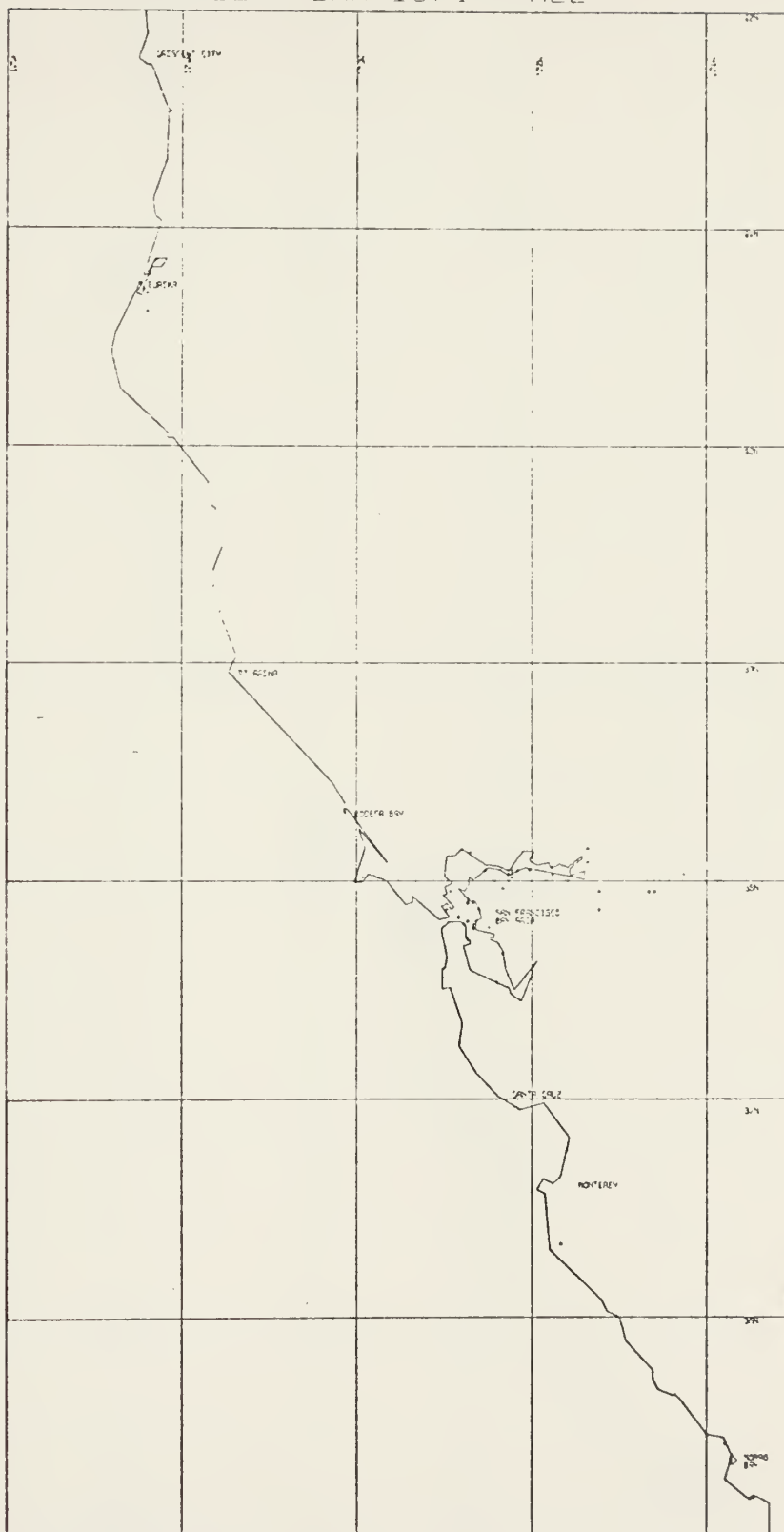


Figure 18





NO RESPONSE ANTICIPATED  
 COAST GUARD DISTRICT  
 TWELVE  
 POLLUTION INCIDENTS  
 CALENDAR YEAR 1974 - ALL

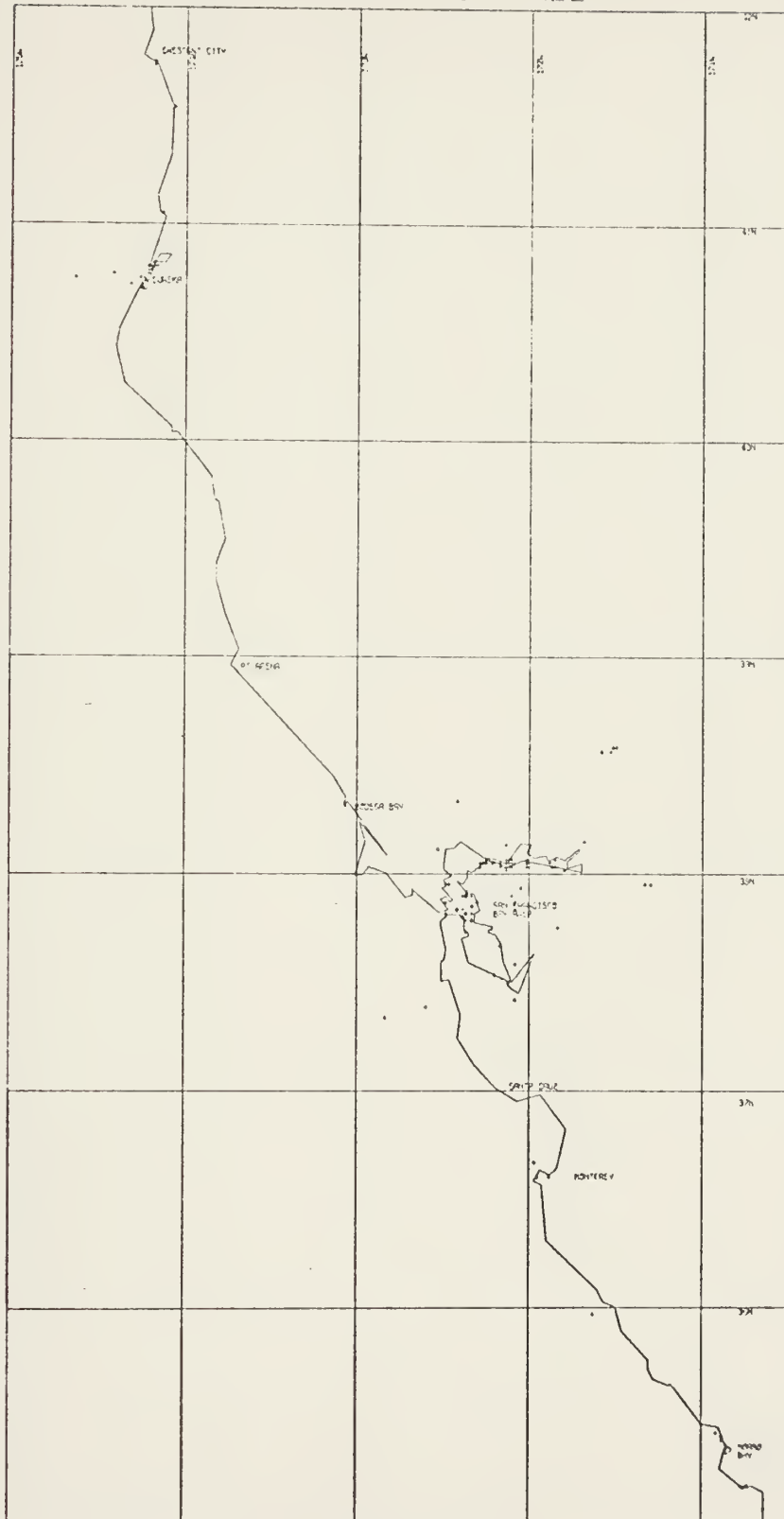


Figure 19



COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974-GOVERNMENT

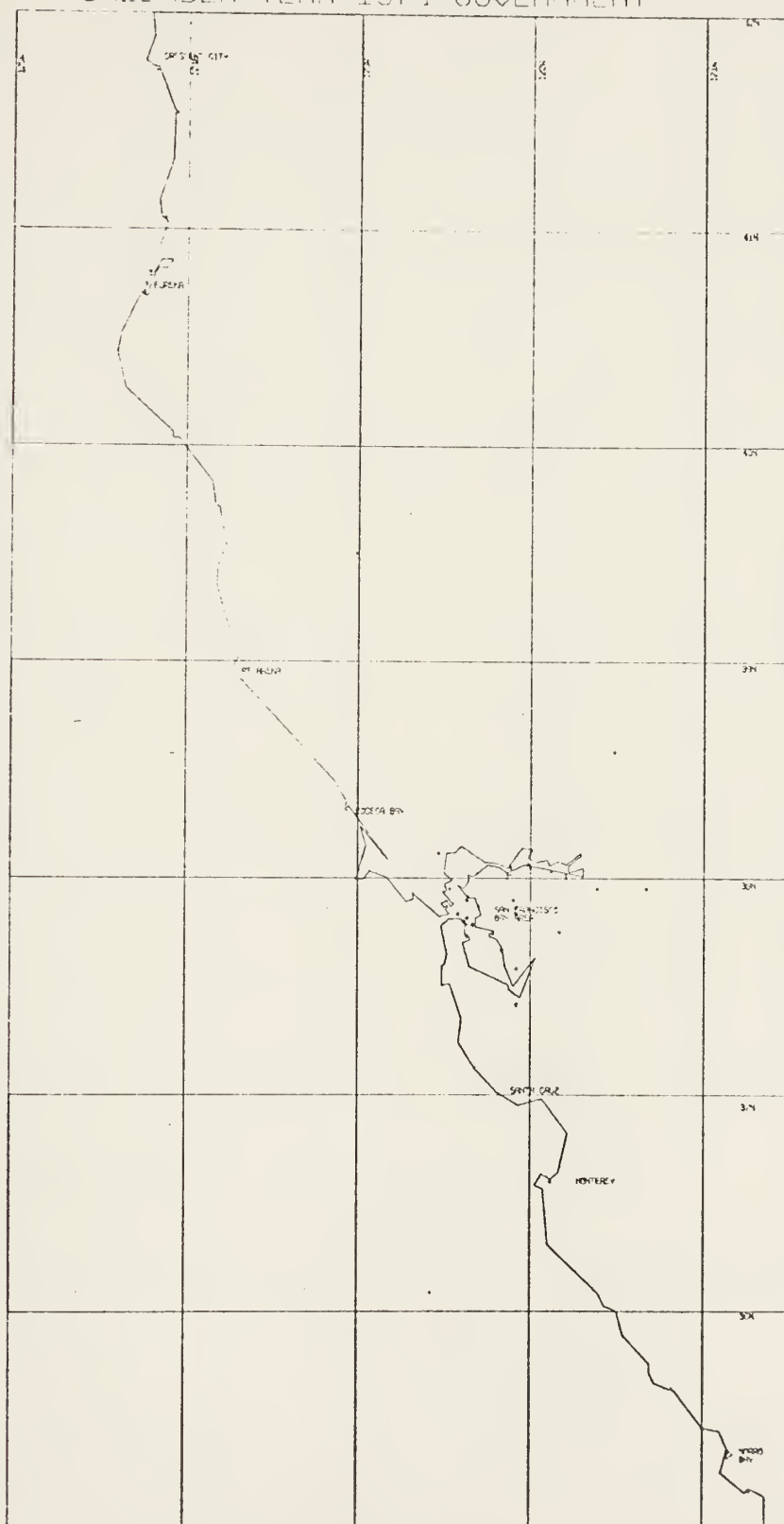


Figure 20



COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974 - SPILLER

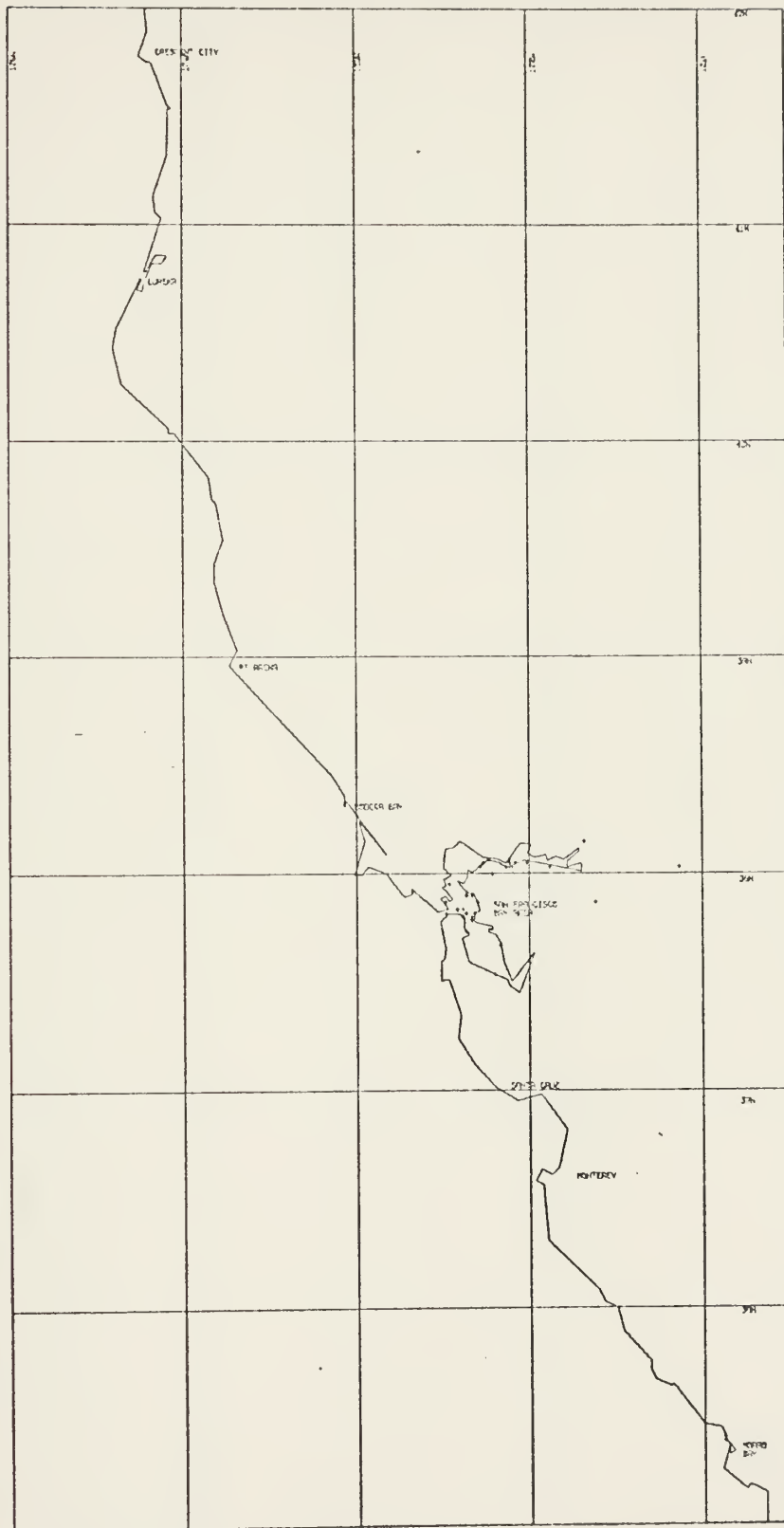


Figure 21









COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974 -UNKNOWN

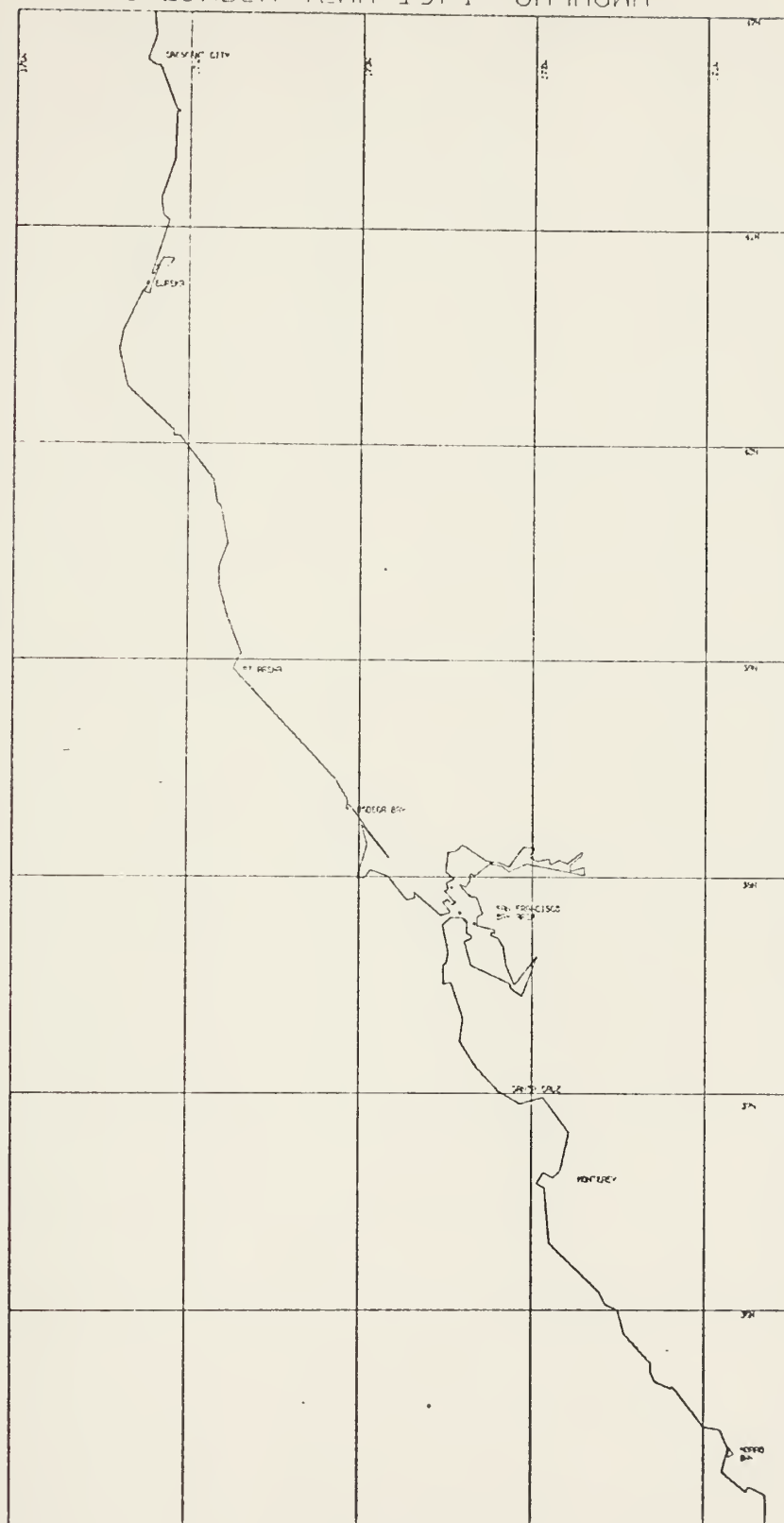


Figure 23



COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974 - ALL CG

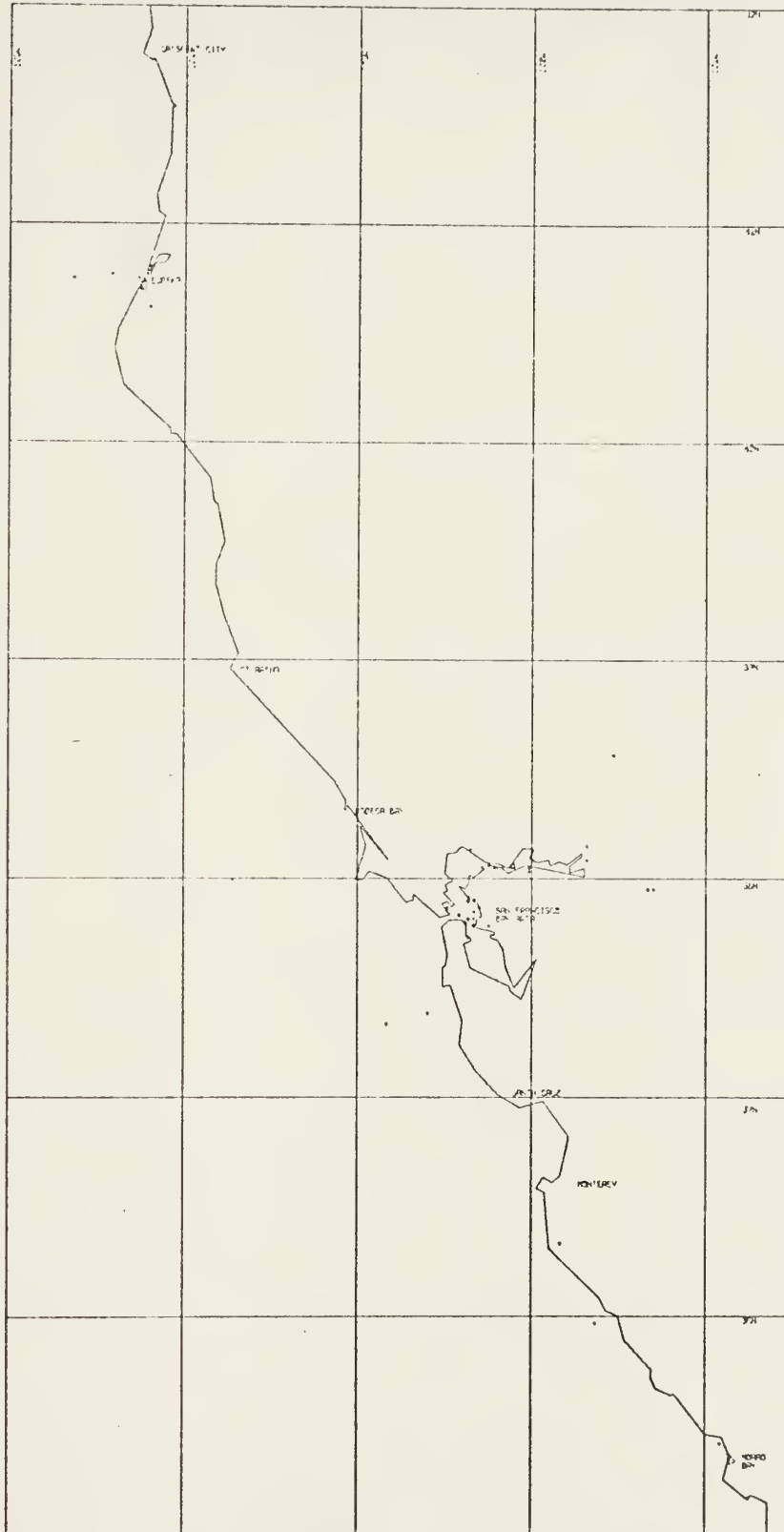


Figure 24



COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974 - CG HELD

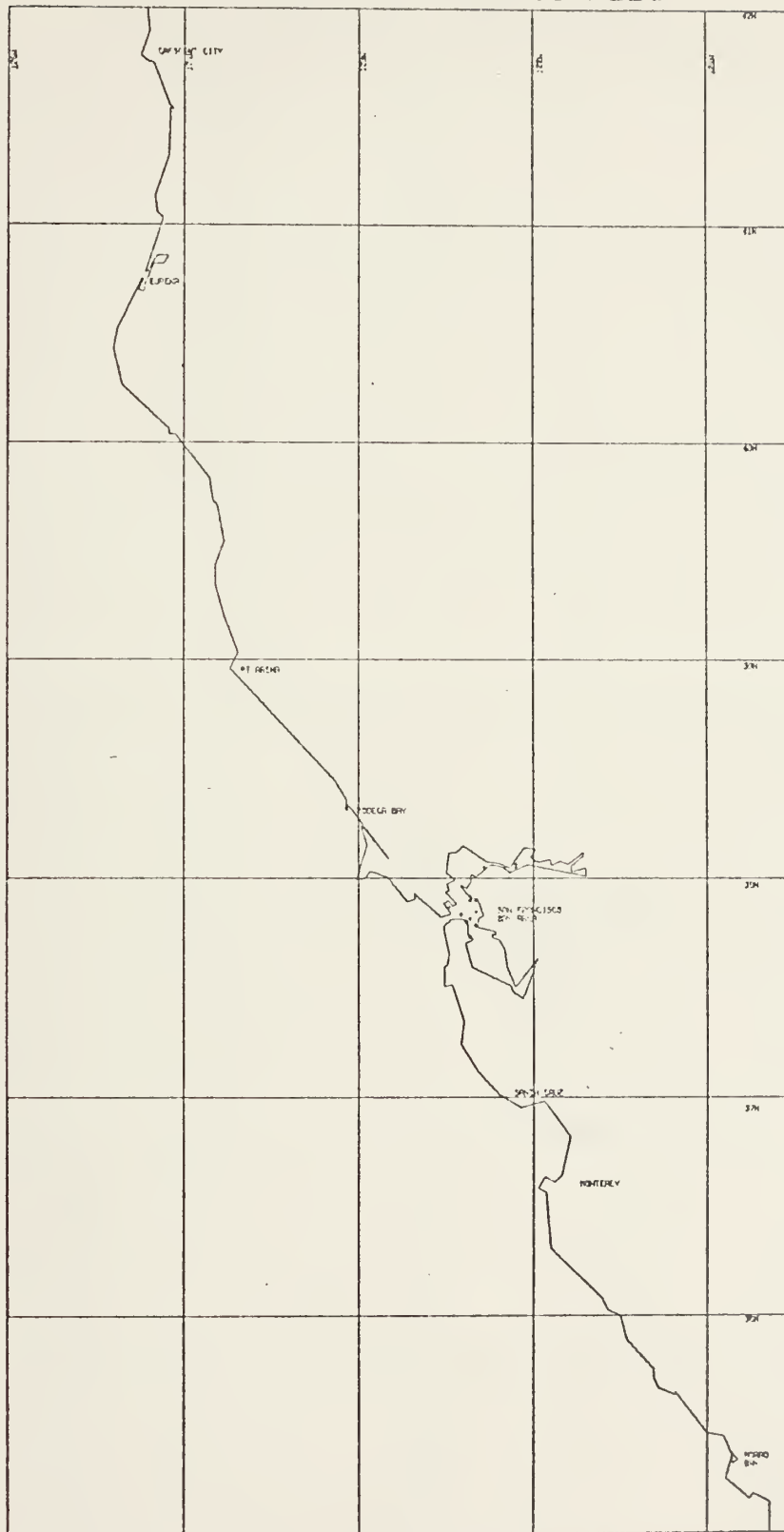


Figure 25



COAST GUARD DISTRICT  
TWELVE  
POLLUTION INCIDENTS  
CALENDAR YEAR 1974 - CG FW

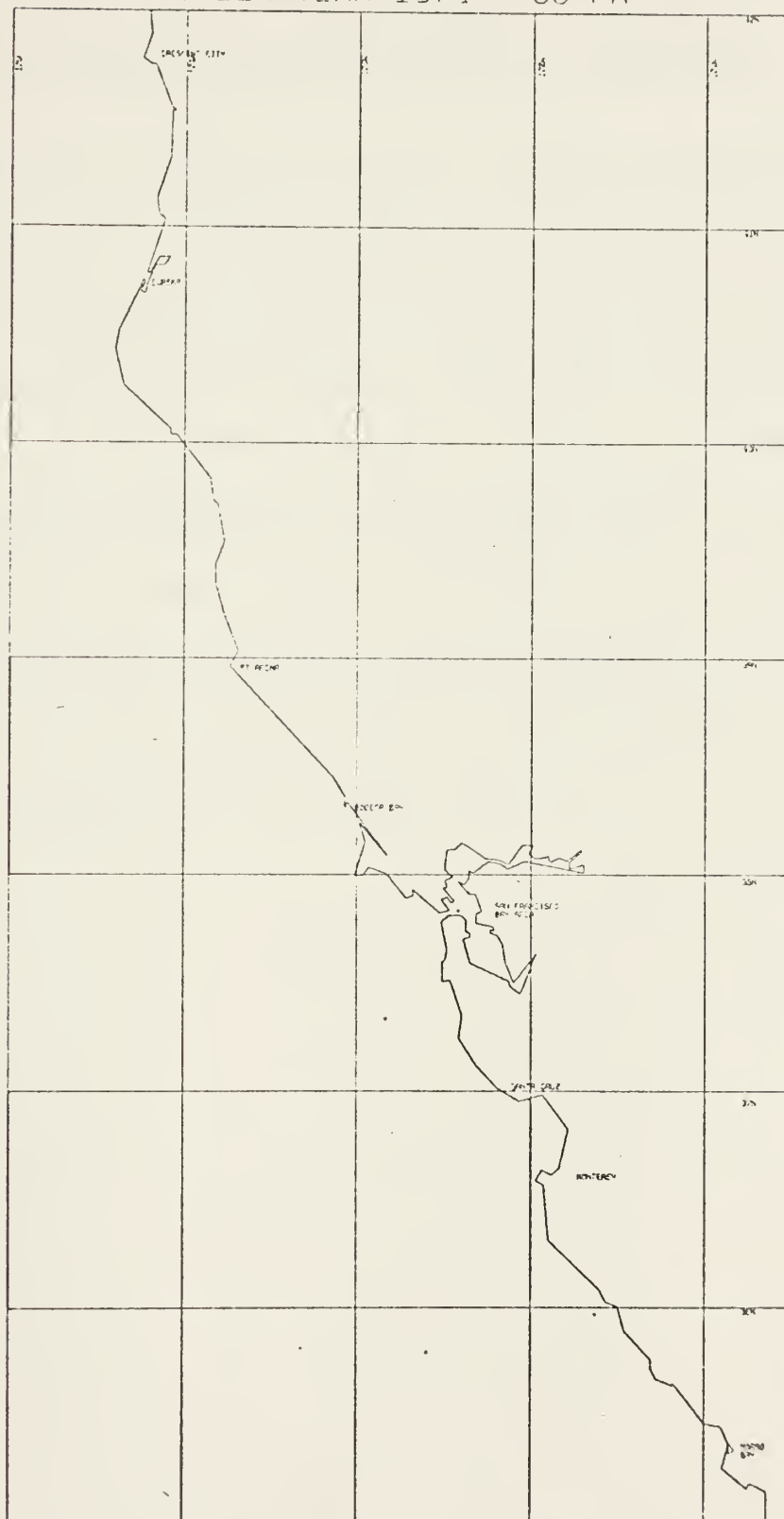


Figure 26





## APPENDIX D

### EXAMPLES OF SPSS OUTPUTS USING PIRS DATA

The following are examples of outputs using the subprograms FREQUENCIES and CROSSTABS from the Statistical Package for Social Sciences (SPSS reference). The data examined were magnetic tapes of the Pollution Incident Reporting System (PIRS) master file for the calendar years 1973 and 1974. FREQUENCIES gives a breakdown of the data field while CROSSTABS sets up a matrix of the two or more variables that are examined. SPSS has recently incorporated and sells the computer package to government computer centers at an initial cost of \$1250.00. If desired, after the first year amendment and consultation service may be purchased for \$600.00 a year.



SPSS Frequency Output From Nationwide 1973 PIRS Data  
for Response Data Field

| FILE.....PIRS..... |      | (CREATION DATE = 10/01/75) |                           | DISCHARGE                 |                      |
|--------------------|------|----------------------------|---------------------------|---------------------------|----------------------|
| RESPONSE           |      |                            |                           |                           |                      |
| CATEGORY LABEL     | CODE | ABSOLUTE<br>FREQ           | RELATIVE<br>FREQ<br>(PCT) | ADJUSTED<br>FREQ<br>(PCT) | CUM<br>FREQ<br>(PCT) |
| SOME RESPONSE      | 0.   | 2875                       | 28.6                      | 28.6                      | 28.6                 |
| DISSIPATED         | 1.   | 7036                       | 51.9                      | 51.9                      | 80.5                 |
| INACCESSIBLE       | 2.   | 1119                       | 8.3                       | 8.3                       | 88.8                 |
| LOCATION           | 3.   | 302                        | 2.2                       | 2.2                       | 91.0                 |
| SMALL SIZE         | 4.   | 847                        | 6.2                       | 6.2                       | 97.2                 |
| POTENTIAL          | 5.   | 150                        | 1.2                       | 1.2                       | 98.4                 |
| NON-REMOVABLE      | 6.   | 215                        | 1.6                       | 1.6                       | 100.0                |
| TOTAL              |      | 13554                      | 100.0                     | 100.0                     |                      |

Figure 27



SPSS Frequency Line Graph Output From Nationwide 1973 PIRS Data  
for Response Data Field

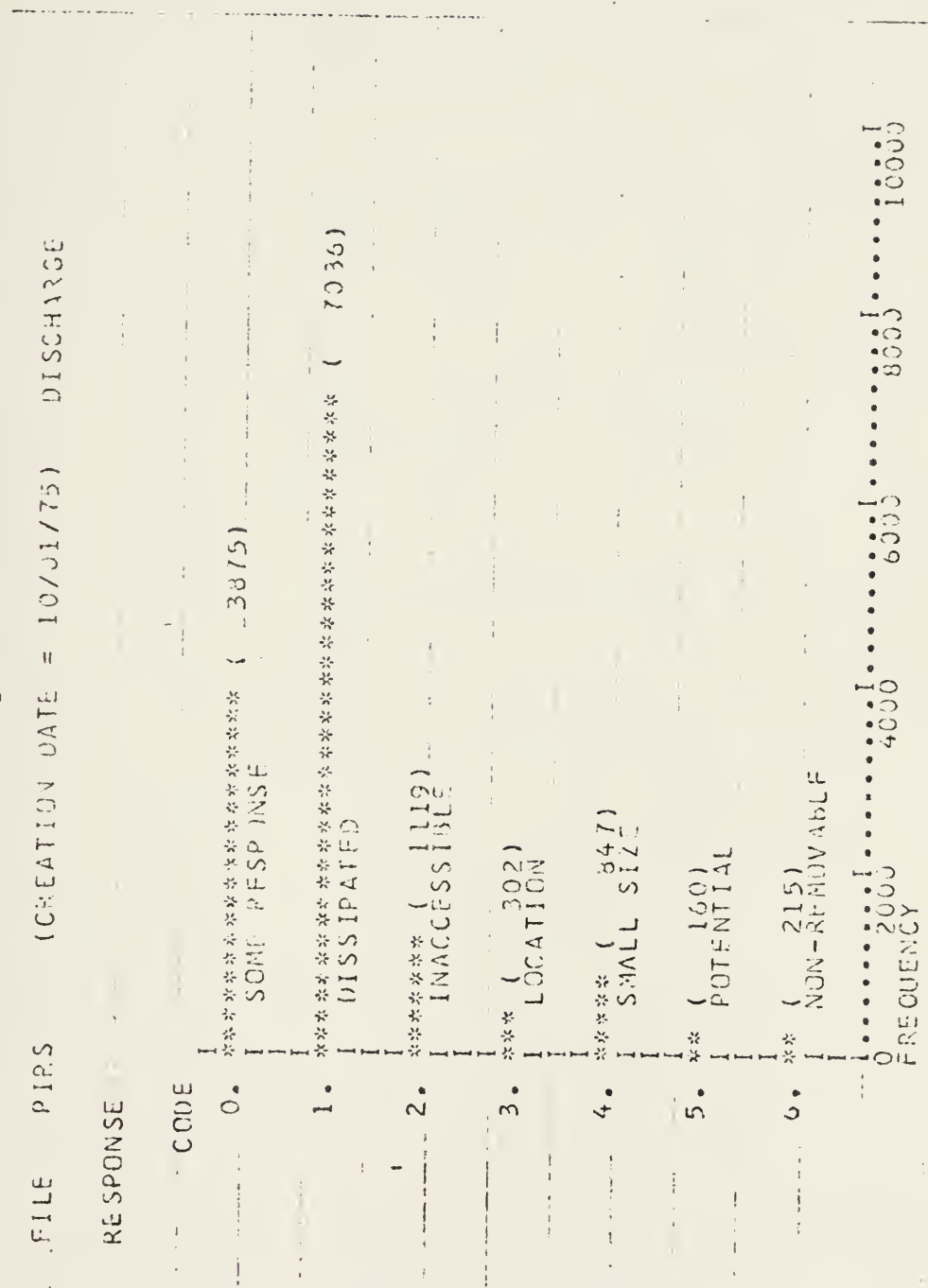


Figure 28



SPSS Frequency Output From 1973 Nationwide PIRS Data  
for Quantity Data Field

| FILE              | PIPS | (CREATION DATE = 10/01/75) | DISCHARGE                 |                           |                      |
|-------------------|------|----------------------------|---------------------------|---------------------------|----------------------|
| QUANTITY          |      |                            |                           |                           |                      |
| CATEGORY LABEL    | CODE | ABSOLUTE<br>FREQ           | RELATIVE<br>FREQ<br>(PCT) | ADJUSTED<br>FREQ<br>(PCT) | CUM<br>FREQ<br>(PCT) |
| 10000 LESS        | 1.   | 8544                       | 63.0                      | 63.0                      | 63.0                 |
| 11-10000          | 2.   | 3013                       | 22.2                      | 22.2                      | 85.3                 |
| 101-100000        | 3.   | 1337                       | 9.9                       | 9.9                       | 95.1                 |
| 1001-1000000      | 4.   | 490                        | 3.6                       | 3.6                       | 98.7                 |
| 10001-10000000    | 5.   | 115                        | 0.9                       | 0.9                       | 99.6                 |
| GREATER 100000000 | 6.   | 54                         | 0.4                       | 0.4                       | 100.0                |
| TOTAL             |      | 13554                      | 100.0                     | 100.0                     |                      |

Figure 29





SPSS Frequency Line Graph Output From 1973 Nationwide PIRS Data  
for Quantity Data Field

| FILE      | PIKS              | (CREATION DATE = 10/01/75) | DISCHARGE       |
|-----------|-------------------|----------------------------|-----------------|
| QUANTITY  |                   |                            |                 |
| CODE      |                   |                            |                 |
| 1.        | ***** ( 8544 )    |                            |                 |
|           | 10GAL LESS        |                            |                 |
| 2.        | ***** ( 3013 )    |                            |                 |
|           | 11-100GAL         |                            |                 |
| 3.        | ***** ( 1337 )    |                            |                 |
|           | 101-1000GAL       |                            |                 |
| 4.        | ***** ( 490 )     |                            |                 |
|           | 1001-10000GAL     |                            |                 |
| 5.        | ***** ( 116 )     |                            |                 |
|           | 10001-100000GAL   |                            |                 |
| 6.        | ***** ( 54 )      |                            |                 |
|           | GREATER 100000GAL |                            |                 |
| FREQUENCY |                   |                            |                 |
| 0         | 2000              | 4000                       | 6000 8000 10000 |

Figure 30



NOTIFIER CROSS TABULATION BY RESPONSE

| NOTIFIER         | COUNT   |         | RESPONSE          |        | DISSIPAT<br>ED | INACCESS<br>IBLE | LOCATION |      | SMALL<br>ZE | SI | POTENTIAL | NON-REMO<br>VABLE | ROW<br>TOTAL |
|------------------|---------|---------|-------------------|--------|----------------|------------------|----------|------|-------------|----|-----------|-------------------|--------------|
|                  | ROW PCT | COL PCT | ISOME<br>RESPONSE | IPONSE |                |                  | 2.1      | 3.1  |             |    | 5.1       | 6.1               |              |
| CG SHORE UNIT    | TOT PCT |         |                   |        |                |                  |          |      |             |    |           |                   |              |
|                  |         |         | 111               | 219    |                |                  | 4.1      | 8.1  | 59          |    | 3         | 17                | 421          |
|                  |         |         | 26.4              | 52.0   |                |                  | 1.0      | 1.9  | 14.0        |    | 0.7       | 4.0               | 3.1          |
| CG BOAT          |         |         | 2.9               | 3.1    |                |                  | 0.4      | 2.6  | 7.0         |    | 1.0       | 7.9               |              |
|                  |         |         | 0.8               | 1.6    |                |                  | 0.0      | 0.1  | 0.4         |    | 0.0       | 0.1               |              |
|                  |         |         |                   |        |                |                  |          |      |             |    |           |                   |              |
| CG SHIP          |         |         | 45                | 170    |                |                  | 0        | 8.1  | 31          |    | 3         | 9                 | 266          |
|                  |         |         | 16.9              | 63.9   |                |                  | 0.0      | 3.0  | 11.7        |    | 1.1       | 3.4               | 2.0          |
|                  |         |         | 1.2               | 2.4    |                |                  | 0.0      | 2.6  | 3.7         |    | 1.9       | 4.2               |              |
| CG HELO          |         |         | 0.3               | 1.3    |                |                  | 0.0      | 0.1  | 0.2         |    | 0.0       | 0.1               |              |
|                  |         |         |                   |        |                |                  |          |      |             |    |           |                   |              |
|                  |         |         | 22                | 98     |                |                  | 1.1      | 5.1  | 17          |    | 0         | 1.7               | 144          |
| CG FIXED-WING AI |         |         | 15.3              | 68.1   |                |                  | 0.7      | 3.5  | 11.8        |    | 0.0       | 0.5               | 1.1          |
|                  |         |         | 0.6               | 1.4    |                |                  | 0.1      | 1.7  | 2.0         |    | 0.0       | 0.5               |              |
|                  |         |         | 0.2               | 0.7    |                |                  | 0.0      | 0.0  | 0.1         |    | 0.0       | 0.5               |              |
| CG SPILLER       |         |         | 65                | 762    |                |                  | 19       | 39   | 51          |    | 11        | 20                | 958          |
|                  |         |         | 6.8               | 79.5   |                |                  | 2.0      | 3.1  | 5.3         |    | 1.1       | 2.1               | 7.1          |
|                  |         |         | 1.7               | 10.8   |                |                  | 1.7      | 9.9  | 6.0         |    | 6.9       | 9.3               |              |
| CG TOTAL         |         |         | 0.5               | 5.6    |                |                  | 0.1      | 0.2  | 0.4         |    | 0.1       | 0.1               |              |
|                  |         |         |                   |        |                |                  |          |      |             |    |           |                   |              |
|                  |         |         | 1                 | 31     |                |                  | 1        | 5    | 6           |    | 0         | 0                 | 44           |
| CG TOTAL         |         |         | 2.3               | 70.5   |                |                  | 2.3      | 11.4 | 13.6        |    | 0.0       | 0.0               | 0.3          |
|                  |         |         | 0.0               | 0.4    |                |                  | 0.1      | 1.7  | 0.7         |    | 0.0       | 0.0               |              |
|                  |         |         | 0.0               | 0.2    |                |                  | 0.0      | 0.0  | 0.0         |    | 0.0       | 0.0               |              |
| CG TOTAL         |         |         | 1636              | 1906   |                |                  | 777      | 69   | 6           |    | 61        | 23                | 4559         |
|                  |         |         | 35.9              | 41.8   |                |                  | 17.0     | 1.3  | 2.1         |    | 1.3       | 0.5               | 33.6         |
|                  |         |         | 42.2              | 27.1   |                |                  | 69.4     | 19.9 | 11.3        |    | 38.1      | 10.7              |              |
| CG TOTAL         |         |         | 12.1              | 14.1   |                |                  | 5.7      | 0.4  | 0.7         |    | 0.5       | 0.2               |              |
|                  |         |         |                   |        |                |                  |          |      |             |    |           |                   |              |
|                  |         |         | 32                | 2      |                |                  | 0        | 0    | 0           |    | 1         | 0                 | 65           |
| CG TOTAL         |         |         | 96.5              | 2.4    |                |                  | 0.0      | 0.0  | 0.0         |    | 1.2       | 0.0               | 0.6          |
|                  |         |         | 2.1               | 0.0    |                |                  | 0.0      | 0.0  | 0.0         |    | 0.0       | 0.0               |              |
|                  |         |         | 0.6               | 0.0    |                |                  | 0.0      | 0.0  | 0.0         |    | 0.0       | 0.0               |              |
| CG TOTAL         |         |         | 3879              | 7036   |                |                  | 1119     | 202  | 847         |    | 160       | 215               | 13554        |
|                  |         |         | 28.6              | 51.9   |                |                  | 8.3      | 2.2  | 6.2         |    | 1.2       | 1.6               | 100.0        |
|                  |         |         |                   |        |                |                  |          |      |             |    |           |                   |              |

Figure 31



CROSS TABULATION BY QUANTITY

NOTIFIER

| COUNT            |     | QUANTITY |     | ROW TOTAL  |              | TOTAL          |                    |
|------------------|-----|----------|-----|------------|--------------|----------------|--------------------|
| ROW              | PCT | 100 GAL  | LE  | 11-100 GAL | 101-1000 GAL | 1001-10000 GAL | 100001-1000000 GAL |
| COL              | PCT | 100 GAL  | LE  | 11-100 GAL | 101-1000 GAL | 1001-10000 GAL | 100001-1000000 GAL |
| TOT              | PCT | 100 GAL  | LE  | 11-100 GAL | 101-1000 GAL | 1001-10000 GAL | 100001-1000000 GAL |
| NOTIFIER         |     | 290      | 1.1 | 83         | 27           | 11             | 4                  |
| CG SHORE UNIT    |     | 68.9     |     | 20.9       | 6.4          | 2.6            | 1.0                |
|                  |     | 3.4      |     | 2.9        | 2.0          | 2.2            | 0.9                |
|                  |     | 2.1      |     | 0.6        | 0.2          | 0.1            | 0.0                |
| CG BOAT          |     | 190      |     | 58         | 16           | 3              | 0                  |
|                  |     | 71.4     |     | 21.8       | 6.0          | 0.3            | 0.0                |
|                  |     | 2.2      |     | 1.9        | 1.2          | 0.4            | 0.0                |
|                  |     | 1.4      |     | 0.4        | 0.1          | 0.0            | 0.0                |
| CG SHIP          |     | 110      |     | 24         | 8            | 1              | 0                  |
|                  |     | 76.4     |     | 16.7       | 5.6          | 0.7            | 0.0                |
|                  |     | 1.3      |     | 0.8        | 0.6          | 0.2            | 0.0                |
|                  |     | 0.8      |     | 0.2        | 0.1          | 0.0            | 0.0                |
| CG HELU          |     | 843      |     | 94         | 13           | 4              | 3                  |
|                  |     | 83.0     |     | 9.8        | 1.4          | 0.4            | 0.3                |
|                  |     | 9.9      |     | 3.1        | 1.0          | 0.8            | 0.5                |
|                  |     | 6.2      |     | 0.7        | 0.1          | 0.0            | 0.0                |
| CG FIXED-WING AI |     | 34       |     | 8          | 0            | 2              | 0                  |
|                  |     | 77.3     |     | 18.2       | 0.0          | 5              | 0.0                |
|                  |     | 0.4      |     | 0.3        | 0.0          | 0.4            | 0.0                |
|                  |     | 0.3      |     | 0.1        | 0.0          | 0.0            | 0.0                |
| SPIILER          |     | 2409     |     | 1263       | 593          | 204            | 51                 |
|                  |     | 52.8     |     | 27.7       | 13.0         | 45             | 1.3                |
|                  |     | 28.2     |     | 41.9       | 4.4          | 41.6           | 52.5               |
|                  |     | 17.3     |     | 9.3        | 4.4          | 1.5            | 0.5                |
|                  |     | 75       |     | 8          | 1            | 0              | 1                  |
|                  |     | 88.2     |     | 9.4        | 1.2          | 0.0            | 1.2                |
|                  |     | 0.9      |     | 0.3        | 0.1          | 0.0            | 0.9                |
|                  |     | 0.6      |     | 0.1        | 0.0          | 0.0            | 0.0                |
| COLUMN TOTAL     |     | 3544     |     | 3013       | 1357         | 490            | 116                |
|                  |     | 83.0     |     | 22.2       | 19.9         | 3.6            | 0.9                |

Figure 32



## APPENDIX E

### CARD FORMAT AND OUTPUT FOR AIRCRAFT FLIGHT RECORD

First, the card format for the "blue sheets" is listed and following it is an example of the computer output used in demonstrating what type of information could be obtained from the individual flight record. The program is written in FORTRAN and used data from Air Station San Francisco Aircraft Flight Records for the quarter ending 31 March 1974.





TABLE XIII  
AIRCRAFT FLIGHT RECORD  
DATA CARD FORMAT

| <u>Columns</u> | <u>Data Field</u>   |
|----------------|---|
| 1-2            | Year  |
| 3-4            | Month   |
| 5-6            | Day   |
| 8              | Type Aircraft = 1    HH-52A<br>2    HU-16E<br>3    HC-130 |
| 10             | Number of Pollution Detections                            |
| 12-14          | Total Resource Hours                                      |
| 17-19          | SAR Resource Hours  |
| 21-23          | MEP Resource Hours  |
| 27-29          | Operational Training Resource Hours                       |
| 31-33          | ELT Resource Hours  |
| 37-39          | Other Resource Hours                                      |
| 41-43          | Total Employment Hours                                    |
| 47-49          | SAR Employment Hours                                      |
| 51-52          | Operational Training Employment Hours                     |
| 57-59          | MEP Employment Hours                                      |
| 61-62          | ELT Employment Hours                                      |
| 67-69          | Other Employment Hours                                    |



Computer Output from Air Station San Francisco  
from Aircraft Flight Record for  
Quarter Ending 31 March 1974 for the HH-52A Helicopter

|   |       |  |
|---|-------|--|
| TOTAL EMPLOYMENT HOURS CATEGORY 1         | 456.0 |  |
| TOTAL RESOURCE HOURS CATEGORY 1           | 436.8 |  |
| AVERAGE RESOURCE HOURS CATEGORY 1         | 1.6   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 1       | 1.7   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 1   | 1.5   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 1 | 1.6   |  |
| TOTAL EMPLOYMENT HOURS CATEGORY 2         | 161.1 |  |
| TOTAL RESOURCE HOURS CATEGORY 2           | 156.0 |  |
| AVERAGE RESOURCE HOURS CATEGORY 2         | 0.6   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 2       | 0.6   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 2   | 0.6   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 2 | 0.1   |  |
| TOTAL EMPLOYMENT HOURS CATEGORY 3         | 119.0 |  |
| TOTAL RESOURCE HOURS CATEGORY 3           | 99.9  |  |
| AVERAGE RESOURCE HOURS CATEGORY 3         | 0.4   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 3       | 0.4   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 3   | 0.7   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 3 | 0.5   |  |
| TOTAL EMPLOYMENT HOURS CATEGORY 4         | 109.0 |  |
| TOTAL RESOURCE HOURS CATEGORY 4           | 115.2 |  |
| AVERAGE RESOURCE HOURS CATEGORY 4         | 0.4   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 4       | 0.4   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 4   | 0.4   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 4 | 0.7   |  |
| TOTAL EMPLOYMENT HOURS CATEGORY 5         | 0.0   |  |
| TOTAL RESOURCE HOURS CATEGORY 5           | 0.0   |  |
| AVERAGE RESOURCE HOURS CATEGORY 5         | 0.0   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 5       | 0.0   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 5   | 0.0   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 5 | 0.0   |  |
| TOTAL EMPLOYMENT HOURS CATEGORY 6         | 66.9  |  |
| TOTAL RESOURCE HOURS CATEGORY 6           | 65.7  |  |
| AVERAGE RESOURCE HOURS CATEGORY 6         | 0.2   |  |
| AVERAGE EMPLOYMENT HOURS CATEGORY 6       | 0.2   |  |
| AVERAGE RESOURCE HOURS WITH DETECTION 6   | 0.3   |  |
| AVERAGE EMPLOYMENT HOURS WITH DETECTION 6 | 0.3   |  |
| RESOURCE HOURS DETECTIONS CREDITED 2      | 0.57  |  |
| EMPLOYMENT HOURS DETECTIONS CREDITED 2    | 0.50  |  |
| RESOURCE HOURS DETECTIONS CREDITED 3      | 6.12  |  |
| EMPLOYMENT HOURS DETECTIONS CREDITED 3    | 1.64  |  |
| RESOURCE HOURS DETECTIONS CREDITED 4      | 1.69  |  |
| EMPLOYMENT HOURS DETECTIONS CREDITED 4    | 6.24  |  |
| RESOURCE HOURS DETECTIONS CREDITED 5      | 0.0   |  |
| EMPLOYMENT HOURS DETECTIONS CREDITED 5    | 0.0   |  |
| RESOURCE HOURS DETECTIONS CREDITED 6      | 1.62  |  |
| EMPLOYMENT HOURS DETECTIONS CREDITED 6    | 1.62  |  |
| NUMBER OF DETECTIONS                      | 10    |  |
| NUMBER OF CARDS                           | 271   |  |
| MEP EMPLOYMENT HOURS SINGLE MISSION       | 93.2  |  |

Figure 33



## APPENDIX F

### TABLES OF POLLUTION INCIDENT CHARACTERISTICS FROM PIRS DATA

This appendix lists incident characteristics for two areas, nationwide and the Twelfth Coast Guard District. In each area three levels are examined: all incidents; all Coast Guard-detected incidents; and Coast Guard Aircraft-detected incidents. The tables are for the years 1973 and 1974 and used data from PIRS.



TABLE XIV  
POLLUTION INCIDENT CHARACTERISTICS FOR ALL AND COAST GUARD DETECTED  
NATIONWIDE PIRS DATA (%)

|                                    | All<br>1973 | All<br>1974 | Coast Guard<br>Only<br>1973 | Coast Guard<br>Only<br>1974 |
|------------------------------------|-------------|-------------|-----------------------------|-----------------------------|
| Total Number of Incidents          | 13,554      | 14,454      | 2888                        | 3141                        |
| I. Waterbody by Location           |             |             |                             |                             |
| Inland                             | 1735(12.8)  | 2876(19.9)  | 310(10.7)                   | 399(12.7)                   |
| Atlantic Coastal                   | 3429(25.3)  | 3455(23.9)  | 1248(43.2)                  | 1313(41.8)                  |
| Atlantic Offshore                  | 95(0.7)     | 231(1.6)    | 51(1.8)                     | 115(3.7)                    |
| Pacific Coastal                    | 3023(22.3)  | 2660(18.4)  | 889(30.8)                   | 793(25.2)                   |
| Pacific Offshore                   | 217(1.6)    | 145(1.0)    | 75(2.6)                     | 33(1.0)                     |
| Gulf Coastal                       | 3009(22.2)  | 3209(22.2)  | 171(5.9)                    | 320(10.2)                   |
| Gulf Offshore                      | 1437(10.6)  | 1286(8.9)   | 3(0.1)                      | 34(1.1)                     |
| Great Lakes                        | 501(3.7)    | 448(3.1)    | 129(4.5)                    | 129(4.1)                    |
| Unknown                            | 108(.8)     | 144(1.0)    | 6(0.4)                      | 8(0.2)                      |
| II. Source                         |             |             |                             |                             |
| Vessel                             | 3670(27.1)  | 3975(27.5)  | 858(29.7)                   | 900(28.7)                   |
| Marine Facility                    | 501(3.7)    | 622(4.3)    | 120(4.2)                    | 145(4.6)                    |
| Land Vehicles                      | 337(2.5)    | 434(3.0)    | 35(1.2)                     | 53(1.7)                     |
| Land Transportation Facilities     | 163(1.2)    | 217(1.5)    | 49(1.7)                     | 37(1.2)                     |
| Non-Transportation Land Facilities | 1705(12.6)  | 1720(11.9)  | 456(15.8)                   | 367(11.7)                   |
| Offshore Production Facility       | 1965(14.5)  | 2009(13.9)  | 15(0.5)                     | 13(0.4)                     |
| Miscellaneous                      | 350(2.6)    | 375(2.6)    | 96(3.3)                     | 117(3.7)                    |
| Pipeline                           | 583(4.3)    | 593(4.1)    | 24(6.8)                     | 17(0.5)                     |
| Unknown                            | 4280(31.6)  | 4509(31.2)  | 1235(42.8)                  | 1492(47.5)                  |





TABLE XIV (continued)

|                            |               |               |            |            |
|----------------------------|---------------|---------------|------------|------------|
| III. Cause                 |               |               |            |            |
| Structural Failure or Loss | 1491(11.0)    | 1749(12.1)    | 172(6.0)   | 298(9.5)   |
| Equipment Failure          | 3267(24.1)    | 3975(27.5)    | 298(10.3)  | 235(7.5)   |
| Personnel Error            | 2240(16.5)    | 2428(16.8)    | 465(16.1)  | 487(15.5)  |
| Intentional Discharge      | 610(4.5)      | 665(4.6)      | 227(7.9)   | 247(7.9)   |
| Natural Phenomenon         | 352(2.6)      | 390(2.7)      | 136(4.7)   | 121(3.8)   |
| Unknown                    | 5594(41.2)    | 5247(36.2)    | 1590(55.0) | 1753(55.8) |
| IV. Material               |               |               |            |            |
| Petroleum Product          | 11, 128(82.1) | 11, 737(81.2) | 2223(77.0) | 2473(78.7) |
| Liquid Chemical            | 258(1.9)      | 231(1.6)      | 40(1.4)    | 60(1.9)    |
| Other & Miscellaneous      | 556(4.1)      | 491(3.4)      | 188(6.5)   | 147(4.7)   |
| Unknown                    | 1612(11.9)    | 1995(13.8)    | 437(15.1)  | 461(14.7)  |
| V. Quantity                |               |               |            |            |
| 10 gal or less             | 8539(63.0)    | 8990(62.2)    | 2211(76.6) | 2479(78.5) |
| 11 - 100 gal               | 3009(22.2)    | 3006(20.8)    | 475(16.4)  | 473(15.1)  |
| 101 - 1000 gal             | 1342(9.9)     | 1518(10.5)    | 145(5.0)   | 143(4.6)   |
| 1001 - 10,000 gal          | 488(3.6)      | 694(4.8)      | 43(1.5)    | 36(1.1)    |
| 10,001 - 100,000 gal       | 122(0.9)      | 188(1.3)      | 11(0.4)    | 7(0.2)     |
| Greater- 100,000 gal       | 54(0.4)       | 58(0.4)       | 3(0.1)     | 3(0.1)     |
| VI. Response               |               |               |            |            |
| Some response anticipated  | 3875(28.6)    | 5241(36.3)    | 554(19.2)  | 577(18.4)  |
| No response because:       |               |               |            |            |
| Dissipated by Weather      | 7036(51.9)    | 7421(51.3)    | 1864(64.5) | 2044(65.1) |
| Inaccessible               | 1119(8.3)     | 61(0.4)       | 33(1.1)    | 16(0.5)    |
| Location                   | 302(2.2)      | 211(1.5)      | 68(2.4)    | 65(2.1)    |
| Small Size                 | 847(6.2)      | 695(4.8)      | 280(9.7)   | 258(8.2)   |
| Potential Only             | 160(1.2)      | 409(2.8)      | 26(0.9)    | 54(1.7)    |
| Non-Removable              | 215(1.6)      | 415(2.9)      | 63(2.2)    | 127(4.0)   |



TABLE XV

POLLUTION INCIDENT CHARACTERISTICS FOR COAST GUARD AIRCRAFT  
NATIONWIDE PIRS DATA (%)

|      |                                      | 1973      |               | 1974      |               |
|------|--------------------------------------|-----------|---------------|-----------|---------------|
|      |                                      | CG Helo   | CG Fixed Wing | CG Helo   | CG Fixed Wing |
| I.   | Number of Incidents in This Category | 958       | 44            | 1004      | 82            |
| II.  | Location by Water Body               |           |               |           |               |
|      | Inland                               | 50(5.2)   | 2(4.5)        | 41(4.1)   | 1(1.2)        |
|      | Atlantic Coastal                     | 498(52.0) | 19(43.2)      | 526(52.4) | 22(26.8)      |
|      | Atlantic Offshore                    | 35(3.7)   | 5(11.4)       | 51(5.1)   | 24(29.3)      |
|      | Pacific Coastal                      | 239(25.0) | 2(4.5)        | 265(26.4) | 2(2.4)        |
|      | Pacific Offshore                     | 56(5.8)   | 6(13.6)       | 13(1.3)   | 5(6.1)        |
|      | Gulf Coastal                         | 52(5.4)   | 3(6.8)        | 75(7.5)   | 4(4.9)        |
|      | Gulf Offshore                        | 2(0.2)    | 1(2.3)        | 9(0.9)    | 13(15.6)      |
|      | Great Lakes Area                     | 24(2.5)   | 6(13.6)       | 23(2.3)   | 11(13.4)      |
|      | Unknown                              | 2(0.2)    | -             | 1(0.1)    | -             |
| III. | Source                               |           |               |           |               |
|      | Vessel                               | 187(19.6) | 17(38.6)      | 166(16.5) | 34(41.4)      |
|      | Marine Facility                      | 28(2.9)   | 3(6.8)        | 28(2.8)   | 1(1.2)        |
|      | Land Vehicle                         | 1(0.1)    | -             | 3(0.3)    | -             |
|      | Land Transportation Facility         | 5(0.5)    | -             | 4(0.4)    | -             |
|      | Miscellaneous                        | 49(5.1)   | 1(2.3)        | 32(3.2)   | 4(4.9)        |
|      | Pipe Line                            | 3(.3)     | -             | 3(0.3)    | 1(1.2)        |
|      | Non Transportation Facility          | 118(12.3) | 7(15.9)       | 92(9.2)   | 8(9.8)        |
|      | Unknown                              | 567(59.2) | 16(36.4)      | 676(67.3) | 34(41.5)      |



TABLE XV (continued)

|      |                           |           |          |           |          |
|------|---------------------------|-----------|----------|-----------|----------|
| IV.  | Cause                     |           |          |           |          |
|      | Structural Failure        | 21(2.2)   | 1(2.3)   | 43(4.3)   | 3(3.7)   |
|      | Equipment Failure         | 67(7.0)   | 4(9.1)   | 33(3.3)   | 4(4.9)   |
|      | Personnel Error           | 56(5.8)   | 2(4.5)   | 55(5.5)   | 5(6.1)   |
|      | Intentional Discharge     | 62(6.5)   | 3(6.8)   | 68(6.8)   | 13(15.6) |
|      | Natural Phenomenon        | 63(6.6)   | 2(4.5)   | 35(3.5)   | 4(4.9)   |
|      | Unknown                   | 689(71.9) | 32(72.7) | 770(76.7) | 53(64.6) |
| V.   | Material                  |           |          |           |          |
|      | Petroleum Product         | 686(71.6) | 27(61.4) | 744(74.1) | 60(73.2) |
|      | Liquid Chemical           | 8(0.8)    | -        | 22(2.2)   | -        |
|      | Other & Miscellaneous     | 49(5.1)   | -        | 50(5.0)   | 5(6.1)   |
|      | Unknown                   | 215(22.5) | 17(38.6) | 188(18.7) | 17(20.7) |
| VI.  | Quantity                  |           |          |           |          |
|      | 10 gal or less            | 843(88.0) | 34(77.3) | 883(87.9) | 69(84.1) |
|      | 11 - 100 gal              | 94(9.4)   | 8(18.2)  | 89(8.9)   | 11(13.4) |
|      | 101 - 1000 gal            | 13(1.4)   | --       | 22(2.2)   | 2(2.4)   |
|      | 1001 - 10,000 gal         | 4(0.4)    | 2(4.5)   | 9(0.9)    | --       |
|      | 10,001 - 100,000 gal      | 3(0.3)    | --       | 1(0.1)    | --       |
|      | Greater 100,000 gal       | 1(0.1)    | --       | --        | --       |
| VII. | Response                  |           |          |           |          |
|      | Some Response Anticipated | 65(6.8)   | 1(2.3)   | 58(5.8)   | 6(7.3)   |
|      | No Response Because:      |           |          |           |          |
|      | Dissipated by Weather     | 762(79.5) | 31(70.5) | 801(79.8) | 57(69.5) |
|      | Inaccessible              | 19(2.0)   | 1(2.3)   | 5(0.5)    | 1(1.2)   |
|      | Location                  | 30(3.1)   | 5(11.4)  | 26(2.6)   | 7(8.5)   |
|      | Small Size                | 51(5.3)   | 6(13.6)  | 63(6.3)   | 7(8.5)   |
|      | Potential Only            | 11(1.1)   | --       | 11(1.1)   | 1(1.2)   |
|      | Non-Removable             | 20(2.1)   | --       | 40(4.0)   | 3(3.7)   |



TABLE XVI

POLLUTION INCIDENT CHARACTERISTICS FOR ALL AND COAST GUARD DETECTED  
TWELFTH COAST GUARD DISTRICT PIRS DATA (%)

|  | 1973<br>12th CG<br>District<br>All | 1974<br>12th CG<br>District<br>All | 1973<br>All CG<br>Within<br>12th CG District | 1974<br>All CG<br>Within<br>12th CG District |
|--|------------------------------------|------------------------------------|--|--|
|  |                                    |                                    |  |  |
| I. Number of Incidents<br>in This Category | 660                                | 600                                | 188  | 146  |
| II. Location by Water Body                 |                                    |                                    |  |  |
| Inland                                     |                                    |                                    |  |  |
| Pacific Coastal                            | 34(5.2)                            | 73(12.1)                           | 5(2.7)                                       | 19(13.0)                                     |
| Offshore                                   | 601(91.1)                          | 499(83.2)                          | 176(93.6)                                    | 117(80.1)                                    |
| Territorial Sea                            | 9(1.4)                             | 7(1.2)                             | 1(0.5)                                       | 2(1.4)                                       |
| Contiguous Zone                            | 4(0.6)                             | 3(0.5)                             | 3(1.6)                                       | 2(1.4)                                       |
| Prohibited Zone                            | 1(0.1)                             | 3(0.5)                             | 1(0.5)                                       | 2(1.4)                                       |
| Greater 50 Miles Offshore                  | 1(0.1)                             | -                                  | -  | -  |
| Unknown                                    | 10(1.5)                            | 15(2.5)                            | 2(1.1)                                       | 4(2.7)                                       |
| III. Source                                |                                    |                                    |  |  |
| Vessel                                     | 235(35.6)                          | 186(31.0)                          | 59(31.4)                                     | 35(24.0)                                     |
| Marine Facility                            | 22(3.3)                            | 40(6.7)                            | 8(4.3)                                       | 7(4.8)                                       |
| Land Vehicles                              | 27(4.1)                            | 30(5.0)                            | 3(1.6)                                       | 2(1.4)                                       |
| Land Transportation Facility               | 21(3.2)                            | 17(2.8)                            | 7(3.7)                                       | 2(1.4)                                       |
| Miscellaneous                              | 29(4.4)                            | 29(4.8)                            | 8(4.3)                                       | 10(6.8)                                      |
| Pipeline                                   | 5(0.8)                             | 7(1.2)                             | 3(1.6)                                       | -  |
| Unknown                                    | 237(35.9)                          | 250(41.7)                          | 65(34.5)                                     | 80(54.8)                                     |
| Non Transportation Land Facility           | 84(12.7)                           | 41(6.8)                            | 35(18.6)                                     | 10(6.8)                                      |





TABLE XVI (continued)

|      |                           |           |           |           |           |
|------|---------------------------|-----------|-----------|-----------|-----------|
| IV.  | Cause                     |           |           |           |           |
|      | Structural Failure        | 54(8.2)   | 59(9.8)   | 11(5.9)   | 13(8.9)   |
|      | Equipment Failure         | 72(10.9)  | 77(12.8)  | 18(9.6)   | 9(6.2)    |
|      | Personnel Error           | 133(20.2) | 129(21.5) | 38(20.2)  | 23(15.7)  |
|      | Intentional Discharge     | 50(7.6)   | 28(4.7)   | 19(10.1)  | 6(4.1)    |
|      | Natural Phenomenon        | 22(3.3)   | 12(2.0)   | 9(4.8)    | 3(2.1)    |
|      | Unknown                   | 329(49.8) | 295(49.2) | 93(49.4)  | 92(63.0)  |
| V.   | Material                  |           |           |           |           |
|      | Petroleum Product         | 503(76.2) | 397(66.2) | 135(71.9) | 86(58.9)  |
|      | Liquid Chemical           | 17(2.6)   | 12(2.0)   | 4(2.1)    | 2(1.4)    |
|      | Other & Miscellaneous     | 50(7.6)   | 39(6.5)   | 23(12.2)  | 8(5.5)    |
|      | Unknown                   | 90(13.6)  | 152(25.3) | 26(13.8)  | 50(34.2)  |
| VI.  | Quantity                  |           |           |           |           |
|      | 10 gal or less            | 471(71.4) | 384(64.0) | 145(77.1) | 109(74.6) |
|      | 11 - 100 gal              | 116(17.6) | 133(22.2) | 33(17.6)  | 20(13.7)  |
|      | 101 - 1000 gal            | 53(8.0)   | 66(11.0)  | 4(2.1)    | 14(9.6)   |
|      | 1001 - 10,000 gal         | 16(2.4)   | 14(2.3)   | 5(2.7)    | 2(1.4)    |
|      | 10,001 - 100,000 gal      | 1(0.1)    | 3(0.5)    | -         | 1(0.7)    |
|      | Greater 100,000 gal       | 3(0.4)    | -         | 1(0.5)    | -         |
| VII. | Response                  |           |           |           |           |
|      | Some Response Anticipated | 170(25.8) | 166(27.7) | 32(17.0)  | 19(13.0)  |
|      | No Response Because:      |           |           |           |           |
|      | Dissipated by Weather     | 355(53.8) | 333(55.5) | 110(58.5) | 105(71.9) |
|      | Inaccessible              | 6(0.9)    | 3(0.5)    | 1(0.5)    | 1(0.7)    |
|      | Location                  | 11(1.6)   | 20(3.3)   | 2(1.1)    | 3(2.1)    |
|      | Small Size                | 108(16.4) | 68(11.3)  | 40(21.3)  | 14(9.5)   |
|      | Potential Only            | 8(1.2)    | 4(0.7)    | 1(0.5)    | 3(2.1)    |
|      | Non-Removable             | 2(0.3)    | 6(1.0)    | 2(1.1)    | 1(0.7)    |



TABLE XVII

POLLUTION INCIDENT CHARACTERISTICS FOR COAST GUARD AIRCRAFT DETECTED INCIDENTS  
TWELFTH COAST GUARD DISTRICT PIRS DATA (%)

|      | Number of Incidents<br>in This Category | 1973     |               |  | 1974     |               |  |
|------|---|----------|---------------|--|----------|---------------|--|
|      |   | CG Helo  | CG Fixed Wing |  | CG Helo  | CG Fixed Wing |  |
| I.   |   | 52       | 3             |  | 41       | 5             |  |
| II.  | Location by Water Body                  |          |               |  |          |               |  |
|      | Inland                                  | -        | -             |  | 2(4.9)   | -             |  |
|      | Pacific Coastal                         | 51(98.1) | -             |  | 38(92.7) | 1(20.0)       |  |
|      | Off Shore:                              |          |               |  |          |               |  |
|      | Territorial Sea                         | -        | -             |  | -        | 1(20.0)       |  |
|      | Contiguous Zone                         | -        | 2(66.7)       |  | -        | 1(20.0)       |  |
|      | Prohibited Zone                         | -        | 1(33.3)       |  | -        | 2(40.0)       |  |
|      | Greater 50 Miles Offshore               | -        | -             |  | -        | -             |  |
|      | Unknown                                 | 1(1.7)   | -             |  | 1(2.4)   | -             |  |
| III. | Source                                  |          |               |  |          |               |  |
|      | Vessel                                  | 11(21.2) | 3(100.0)      |  | -        | 3(60.0)       |  |
|      | Marine Facility                         | -        | -             |  | 2(4.9)   | -             |  |
|      | Land Vehicles                           | -        | -             |  | -        | -             |  |
|      | Land Transportation Facility            | -        | -             |  | -        | -             |  |
|      | Pipeline                                | -        | -             |  | -        | -             |  |
|      | Non Transportation Facility             | 2(3.8)   | -             |  | 2(4.9)   | -             |  |
|      | Miscellaneous                           | 2(3.8)   | -             |  | 1(2.4)   | -             |  |
|      | Unknown                                 | 37(71.2) | -             |  | 36(87.8) | 2(40.0)       |  |



TABLE XVII (continued)

|      |                           |          |          |          |          |
|------|---------------------------|----------|----------|----------|----------|
| IV.  | Cause                     |          |          |          |          |
|      | Structural Failure        | -        | 1(33.3)  | -        | -        |
|      | Equipment Failure         | 2(3.8)   | -        | 2(4.9)   | -        |
|      | Personnel Error           | 1(1.9)   | -        | 1(2.4)   | -        |
|      | Intentional Discharge     | 2(3.8)   | -        | -        | -        |
|      | Natural Phenomenon        | 3(5.8)   | -        | 1(2.4)   | -        |
|      | Unknown                   | 44(84.6) | 2(67.7)  | 36(87.8) | 5(100.0) |
| V.   | Material                  |          |          |          |          |
|      | Petroleum Product         | 35(67.3) | 1(33.3)  | 15(36.6) | 2(40.0)  |
|      | Liquid Chemical           | -        | -        | -        | -        |
|      | Other & Miscellaneous     | 3(5.8)   | -        | 3(7.3)   | -        |
|      | Unknown                   | 14(26.9) | 2(67.7)  | 23(56.1) | 3(60.0)  |
| VI.  | Quantity                  |          |          |          |          |
|      | 10 gal or less            | 49(94.2) | 1(33.3)  | 37(90.2) | 4(80.0)  |
|      | 11 - 100 gal              | 2(3.8)   | 1(33.3)  | 3(7.3)   | 1(20.0)  |
|      | 101 - 1000 gal            | -        | -        | 1(2.4)   | -        |
|      | 1001 - 10,000 gal         | -        | 1(33.3)  | -        | -        |
|      | 10,001 - 100,000 gal      | -        | -        | -        | -        |
|      | Greater 100,000 gal       | 1(1.9)   | -        | -        | -        |
| VII. | Response                  |          |          |          |          |
|      | Some Response Anticipated | 4(7.7)   | -        | 1(2.4)   | -        |
|      | No Response Because:      |          |          |          |          |
|      | Dissipated by Weather     | 34(65.4) | 3(100.0) | 38(92.7) | 3(60.0)  |
|      | Inaccessible              | -        | -        | -        | 1(20.0)  |
|      | Location                  | -        | -        | -        | -        |
|      | Small Size                | 14(26.9) | -        | 2(4.9)   | 1(20.0)  |
|      | Potential Only            | -        | -        | -        | -        |
|      | Non-Removable             | -        | -        | -        | -        |



## APPENDIX G

### COBOL RECORD FORMATS FOR PROPOSED AIRCRAFT POLLUTION REPORTING SYSTEM

This appendix lists suggested record formats in COBOL language for the proposed aircraft reporting system discussed in Chapter V.

There are three records: individual, mission and MEP.





## TABLE XVIII

## PROPOSED INDIVIDUAL RECORD COBOL FOR MAT

|    |                          |          |
|----|--------------------------|----------|
| 01 | Individual               |          |
| 02 | Record-Number-Indiv      |          |
|    | 03 Air-Station-ID-Indiv  | PIC 99   |
|    | 03 Indiv-Record-Number   | PIC 9(5) |
| 02 | Aircraft-Type            | PIC 9    |
| 02 | Aircraft-Number          | PIC 9(4) |
| 02 | Julian-Date              | PIC 9(3) |
| 02 | Total-Flight-Time        | PIC 99V9 |
| 02 | Departure-Point          | PIC X(3) |
| 02 | Arrival-Point            | PIC X(3) |
| 02 | First-Pilot-Time         | PIC 99V9 |
| 02 | Copilot-Time             | PIC 99V9 |
| 02 | Special Crew-Time        | PIC 99V9 |
| 02 | Training                 |          |
|    | 03 Syllabus-Type         | PIC X(2) |
|    | 03 Syb-Completion-Code   | PIC A    |
|    | 03 Maneuver-Type-One     | PIC X    |
|    | 03 Maneuver-Number-One   | PIC 9    |
|    | 03 Maneuver-Type-Two     | PIC X    |
|    | 03 Maneuver-Number-Two   | PIC 9    |
|    | 03 Maneuver-Type-Three   | PIC X    |
|    | 03 Maneuver-Number-Three | PIC 9    |



|    |                   |          |
|----|-------------------|----------|
| 02 | Night-Time        | PIC 99V9 |
| 02 | Landings          |          |
| 03 | Land-Type-One     | PIC X    |
| 03 | Land-Number-One   | PIC 99   |
| 03 | Land-Type-Two     | PIC X    |
| 03 | Land-Number-Two   | PIC 9    |
| 03 | Land-Type-Three   | PIC X    |
| 03 | Land-Number-Three | PIC 9    |
| 02 | Instrument-Time   |          |
| 03 | Actual-Time       | PIC 99V9 |
| 03 | Simulated-Time    | PIC 99V9 |
| 02 | Approaches        |          |
| 03 | First-One         |          |
| 04 | Type-One          | PIC A    |
| 04 | Act-or-Sim-One    | PIC A    |
| 04 | Number-One        | PIC 9    |
| 03 | Second-Two        |          |
| 04 | Type-Two          | PIC A    |
| 04 | Act-or-Sim-Two    | PIC A    |
| 04 | Number-Two        | PIC 9    |
| 03 | Third-Three       |          |
| 04 | Type-Three        | PIC A    |
| 04 | Act-or-Sim-Three  | PIC A    |
| 04 | Number-Three      | PIC 9    |



|    |                    |       |
|----|--------------------|-------|
| 02 | Mark-If-Last-Indiv | PIC 9 |
| 02 | Number-of-Indiv    | PIC 9 |
| 02 | Indiv-Code         | PIC A |



# TABLE XIX

## PROPOSED MISSION RECORD COBOL FORMAT

|    |                       |          |
|----|-----------------------|----------|
| 01 | Mission               |          |
| 02 | Record-Number-MIS     |          |
|    | 03 Air-Station-ID-MIS | PIC 99   |
|    | 03 Mis-Record-Number  | PIC 9(5) |
| 02 | Flight-Code           | PIC 99   |
| 02 | Start-Time-MIS        | PIC 9(4) |
| 02 | Stop-Time-MIS         | PIC 9(4) |
| 02 | Resource-Hrs-MIS      | PIC 99V9 |
| 02 | Employment-Hrs-MIS    | PIC 99V9 |
| 02 | Mark-IF-Last-MIS      | PIC 9    |
| 02 | Number-Of-Mission     | PIC 9    |
| 02 | Mission-Code          | PIC A    |





# TABLE XX

## PROPOSED MEP RECORD COBOL FORMAT

|    |                       |          |
|----|-----------------------|----------|
| 01 | MEP                   |          |
| 02 | Record-Number-MEP     |          |
|    | 03 Air-Station-ID-MEP | PIC 99   |
|    | 03 MEP-Record-Number  | PIC 9(5) |
| 02 | Sensor                |          |
| 02 | Area-Code             |          |
|    | 03 Specific-Area      | PIC 99   |
|    | 03 Water-Body         | PIC 9(3) |
| 02 | Start-Time-MEP        | PIC 9(4) |
| 02 | Stop-Time-MEP         | PIC 9(4) |
| 02 | Resource-Hrs-MEP      | PIC 99V9 |
| 02 | Employment-Hrs-MEP    | PIC 99V9 |
| 02 | Detections            |          |
|    | 03 Type-Detec         | PIC X    |
|    | 03 How-Detec          | PIC X    |
|    | 03 PIRS-ID            |          |
|    | 04 District-ID        | PIC 99   |
|    | 04 IND-District-ID    | PIC 9(5) |
| 02 | Mark-IF-Last-MEP      | PIC 9    |
| 02 | Number-Of-MEP         | PIC 9    |
| 02 | MEP-Code              | PIC A    |



## APPENDIX H

### BREAKDOWN OF THE POLLUTION INCIDENT REPORTING SYSTEM RECORD

The PIRS record is 424 characters long with approximately 68 data fields. The coding for these data fields are listed in CG450 [Reference 14]. There are three main areas in the record: discharge, data on the spill itself; response, data on the cleanup efforts of the spill; and penalty action data on legal actions involved with the spill.

This appendix identifies in detail the 424 characters of the PIRS record.



PIRS Record Characters 1 thru 80

| COL.        |   | DATA     |   | FIELD |   |                 |    |      |    |    |      |    |          |    |    |      |    |       |    |      |    |           |    |        |    |      |    |        |    |         |    |        |    |          |    |       |    |      |  |         |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1           | 2 | DISTRICT |   |       |   | SEQUENCE NUMBER |    | DATE |    |    | TIME |    | LOCATION |    |    |      |    | STATE |    | COMT |    | SPECIES   |    | SOURCE |    |      |    |        |    |         |    |        |    |          |    |       |    |      |  |         |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3           | 4 | 5        | 6 | 7     | 8 | 9               | 10 | 11   | 12 | 13 | 14   | 15 | 16       | 17 | 18 | 19   | 20 | 21    | 22 | 23   | 24 | 25        | 26 | 27     | 28 | 29   | 30 | 31     | 32 | 33      | 34 | 35     | 36 | 37       | 38 | 39    | 40 |      |  |         |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <div></div> |   |          |   |       |   |                 |    |      |    |    |      |    |          |    |    | YEAR |    | MONTH |    | DAY  |    | DAY OF WK |    | HOUR   |    | CODE |    | (LAT.) |    | (LONG.) |    | (BLCK) |    | (R.MILE) |    | STATE |    | COMT |  | SPECIES |  | SOURCE |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|             |   |          |   |       |   |                 |    |      |    |    |      |    |          |    |    |      |    |       |    |      |    |           |    |        |    |      |    |        |    |         |    |        |    |          |    |       |    |      |  |         |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| COL.       | 41          | 42 | 43          | 44 | 45            | 46 | 47          | 48 | 49            | 50 | 51 | 52 | 53 | 54 | 55                | 56 | 57               | 58 | 59       | 60 | 61     | 62 | 63   | 64 | 65 | 66 | 67   | 68 | 69         | 70 | 71   | 72 | 73         | 74 | 75   | 76 | 77         | 78 | 79 | 80 |
|------------|-------------|----|-------------|----|---------------|----|-------------|----|---------------|----|----|----|----|----|-------------------|----|------------------|----|----------|----|--------|----|------|----|----|----|------|----|------------|----|------|----|------------|----|------|----|------------|----|----|----|
| DATA FIELD | SOURCE-COMT |    | AREA OF DEF |    | SHIPPING RATE |    | COMPANY ID. |    | INDUSTRY CODE |    |    |    |    |    | TYPE OF OPERATION |    | TYPE OF MATERIAL |    | QUANTITY |    | AMOUNT |    | CODE |    |    |    | CODE |    | DANGER (1) |    | CODE |    | DANGER (2) |    | CODE |    | DANGER (2) |    |    |    |
|            |             |    |             |    |               |    |             |    |               |    |    |    |    |    |                   |    |                  |    |          |    |        |    |      |    |    |    |      |    |            |    |      |    |            |    |      |    |            |    |    |    |

Figure 34



PIRS Record Characters 81 thru 160

| COL. | WIND SPEED |  | WIND DIRECTION |  | SEA HEIGHT |  | SWELL DIRECTION |  | CURRENT VELOCITY |  | CURRENT DIRECTION |  | NOTICE |  | TIME LATE |  | Anticlockwise |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  | X |  |
|------|------------|--|----------------|--|------------|--|-----------------|--|------------------|--|-------------------|--|--------|--|-----------|--|---------------|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|
|------|------------|--|----------------|--|------------|--|-----------------|--|------------------|--|-------------------|--|--------|--|-----------|--|---------------|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|---|--|

| COL. | DATA FIELD    | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |  |  |  |  |
|------|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
|      | BURNING       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | AGENTS        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | SINKING       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | AGENTS        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | HEAVENS       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | DISCREPANCY   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | COMMERCIAL    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | DOD           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | EPA           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | NATIONAL      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | STRIKE        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | FORCE         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | RESERVE       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | CG            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | REGULAR       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | CG            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|      | VALUETTE / L. |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |

Figure 35





PIRS Record Characters 161 thru 240

| COL. | DATA FIELD | 161       | 162  | 163   | 164       | 165 | 166 | 167 | 168 | 169 | 170 | 171                   | 172 | 173 | 174 | 175              | 176 | 177 | 178 | 179                   | 180 | 181 | 182 | 183        | 184 | 185 | 186 | 187                              | 188 | 189 | 190 | 191                   | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 |
|------|------------|-----------|------|-------|-----------|-----|-----|-----|-----|-----|-----|-----------------------|-----|-----|-----|------------------|-----|-----|-----|-----------------------|-----|-----|-----|------------|-----|-----|-----|----------------------------------|-----|-----|-----|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |            | VOLUNTEER | GOVT | OTHER | PERSONNEL | X   |     |     |     |     |     | DURATION OF RESOURCES |     |     |     | AMOUNT RECOVERED |     |     |     | TOTAL COST OF CLEANUP |     |     |     | COMPLETION |     |     |     | EXPENDITURES FROM POLLUTION FUND |     |     |     | REIMBURSEMENT TO CDDP |     |     |     |     |     |     |     |     |     |
|      |            |           |      |       |           |     |     |     |     |     |     |                       |     |     |     |                  |     |     |     |                       |     |     |     |            |     |     |     |                                  |     |     |     |                       |     |     |     |     |     |     |     |     |     |

| COL. | DATA FIELD | 201       | 202 | 203 | 204 | 205                    | 206 | 207 | 208 | 209   | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
|------|------------|-----------|-----|-----|-----|------------------------|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
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Figure 36



PIRS Record Characters 241 thru 320

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# PIRS Record Characters 401 thru 421

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| COL.       | 401               | 402              | 403 | 404 | 405 | 406  | 407 | 408 | 409 | 410 | 411 | 412       | 413 | 414 | 415 | 416 | 417 | 418                   | 419 | 420 | 421 | 422        | 423 | 424 | 425       | 426 | 427 | 428         | 429 | 430 |   |  |  |  |
| DATA FIELD | Raf to<br>Command | Action<br>Signal | X   |     |     | SAME |     |     | AS  |     |     | 291 - 301 |     |     | X   |     |     | Appeal to<br>US Court | X   |     |     | SETTLEMENT |     |     | COLLECTED |     |     | CASE STATUS |     |     | X |  |  |  |

|       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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| COL.  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| DATA  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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Figure 39





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